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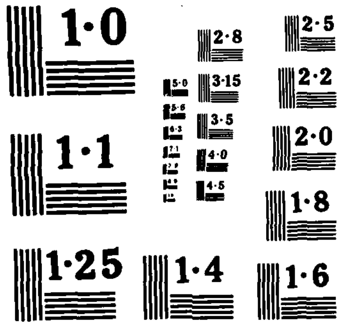

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USAFVAND 10/10/84

AD-A155 822

INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

VANDENBERG AIR FORCE BASE, CALIFORNIA

PREPARED FOR:

HQ SAC/DEPV
OFFUTT AFB, NEBRASKA

WITH THE ASSISTANCE OF:

UNITED STATES AIR FORCE
HQ AFESC/DEVP
TYNDALL AFB, FLORIDA

SUBMITTED BY:

REYNOLDS, SMITH AND HILLS, INC.
JACKSONVILLE, FLORIDA

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
GAINESVILLE, FLORIDA

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The search of USAF, state and federal agency records and interviews with past and present base personnel and agency representatives was conducted to identify past hazardous waste generation and disposal practices at Vandenberg AFB, California. The AFB is located on the south central California coast, approximately 140 miles northwest of Los Angeles, 275 miles south of San Francisco, and 55 miles northwest of Santa Barbara. Eighteen sites were identified as having the potential for environmental contamination ahd have been evaluated using the HARM system. Follow-on recommendations include site clean-up and closure, confirmation studies in the vicinity of past spill sites, and enhanced protecion of local surface waters.

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Capt Charles R. Howell	(402) 294-5854 AV 271-5854	HQ SAC/DEPVQ

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INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

VANDENBERG AIR FORCE BASE, CALIFORNIA

Prepared for:

HQ SAC/DEPV
Offutt AFB, Nebraska

With the Assistance of:

UNITED STATES AIR FORCE
HQ AFESC/DEVP
Tyndall AFB, Florida

Submitted by:

REYNOLDS, SMITH AND HILLS, INC.
Jacksonville, Florida

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

January 1985

NOTICE

This report has been prepared for the U.S. Air Force by Environmental Science and Engineering, Inc., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the U.S. Air Force, or the Department of Defense.

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EXECUTIVE SUMMARY

INTRODUCTION

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is known as the Installation Restoration Program (IRP) and consists of four phases: Phase I—Initial Assessment/ Records Search, Phase II—Confirmation and Quantification, Phase III—Technology Base Development, and Phase IV—Operations/Remedial Actions. Environmental Science and Engineering, Inc. (ESE), as a subsidiary of Reynolds, Smith and Hills, Inc. (RS&H), conducted the Phase I study for Vandenberg Air Force Base (VAFB), with funds provided by the Strategic Air Command, under Contract No. F08637-83 G0010 5004.

INSTALLATION DESCRIPTION

VAFB is located on the south-central California coast, approximately 140 miles northwest of Los Angeles, 275 miles south of San Francisco, and 55 miles northwest of Santa Barbara. The installation occupies 98,400 acres, extends along 35 miles of Santa Barbara County coast, and varies in width from 5 to 15 miles. Nearby communities and towns include Santa Maria, Lompoc, Betteravia, Orcutt, and Casmalia.

The installation currently known as VAFB was first established as Camp Cooke in 1941, when the Army purchased the land for use as a training center for artillery and tank activities. After World War II and several periods of inactivity in the intervening years, the land comprising North Camp Cooke was transferred to the Air Force in 1957. The South Camp Cooke area was transferred to the Navy in 1958 (known as Point Arguello Naval Missile Facility) and assigned to the Air Force in 1964. The primary mission of VAFB is to provide launch, tracking,

training, and other facilities in support of DOD and other range user programs.

ENVIRONMENTAL SETTING

Environmental setting data relevant to the evaluation of past waste management practices at VAFB are described in the following paragraphs.

VAFB is located on Burton Mesa, a low-lying plateau on the south-central California coast. Elevations at VAFB vary from 0 feet (ft) mean sea level (msl) along the Pacific Ocean to 1,500 ft msl in the Purisima Hills north of the cantonment area and 2,150 ft msl in the Santa Ynez Mountains to the south. The major drainage features on VAFB are San Antonio Creek, located north of the cantonment area, and the Santa Ynez River, which separates North and South VAFB. Other streams in VAFB include Shuman Creek, Canada Honda Creek, Bear Creek, Canada Tortuga Creek, and Jalama Creek.

Soils on VAFB consist of sands, silts, clay, clay loams, and shale. These soils are considered permeable and would be susceptible to infiltration by contaminants.

Three major aquifers are found under sections of VAFB. These include the Santa Ynez, Lompoc Terrace, and San Antonio Aquifers. The Santa Ynez and San Antonio Aquifers are located in the unconsolidated alluvial and fluvial sand and gravel deposits which occur at depths up to 1,000 ft under VAFB. The Lompoc Terrace Aquifer underlying South VAFB is located in consolidated and unconsolidated deposits. Recharge to these aquifers occurs primarily from downward leakage of overlying water-bearing units.

Average annual rainfall at VAFB is 15.5 inches, 84.5 percent of which occurs from November through April. The mean annual lake evaporation rate at VAFB is 44 inches. Therefore, the net annual precipitation rate for VAFB (rainfall minus evaporation) is -28.5 inches. The 1-year,

24-hour rainfall event is 3.0 inches in December. Average monthly temperatures range from 69°F in October to 60°F in March. As a result of its coastal location, temperatures are moderated and remain fairly constant throughout the year.

Several threatened and endangered species are known to occur on VAFB and in the area, including the unarmored three-spined stickleback, peregrine falcon, Bell's vireo, and California least tern. The stickleback is known to exist only in San Antonio Creek on VAFB. VAFB personnel, with cooperation from state and Federal wildlife agencies, are attempting to establish other breeding populations on the installation in both Shuman and Canada Honda Creeks.

As a result of the geohydrological environment and soil characteristics, conditions on VAFB are conducive to contaminant migration. Potential contaminant migration would occur laterally through the alluvium deposits in the canyons that open toward Santa Ynez River. Any migration of contaminants into this area could potentially contaminate the Santa Ynez and Lompoc Aquifers, which are used as potable water sources by the town of Lompoc and by VAFB.

METHODOLOGY

During the course of this investigation, interviews were conducted with base personnel (past and current) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state, and Federal agencies; and field and helicopter reconnaissance inspections were conducted at past hazardous waste activity sites.

Sites identified as potentially containing hazardous contaminants resulting from past activities have been assessed using the Hazard Assessment Rating Methodology (HARM), in which factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices are considered. The details

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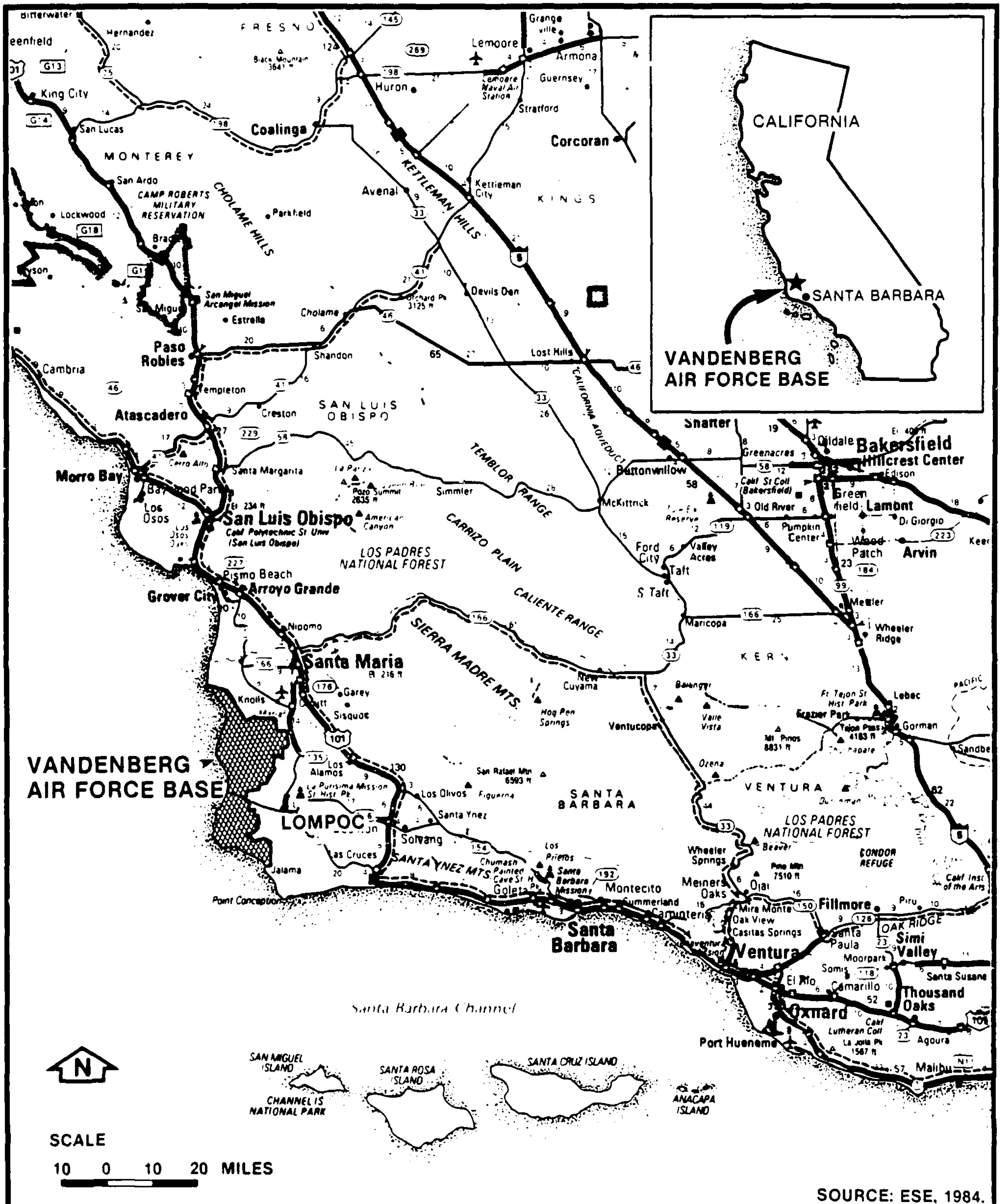


Figure 2.1-1
LOCATION MAP OF VANDENBERG AIR FORCE BASE

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

2.0 INSTALLATION DESCRIPTION

2.1 LOCATION, SIZE, AND BOUNDARIES

VAFB is located on California's south-central coast, approximately 275 miles south of San Francisco, 140 miles northwest of Los Angeles, and 55 miles northwest of Santa Barbara (see Fig. 2.1-1). The base's unique location on a promontory along the California coast allows launching of missiles westerly and southerly over the Pacific Ocean.

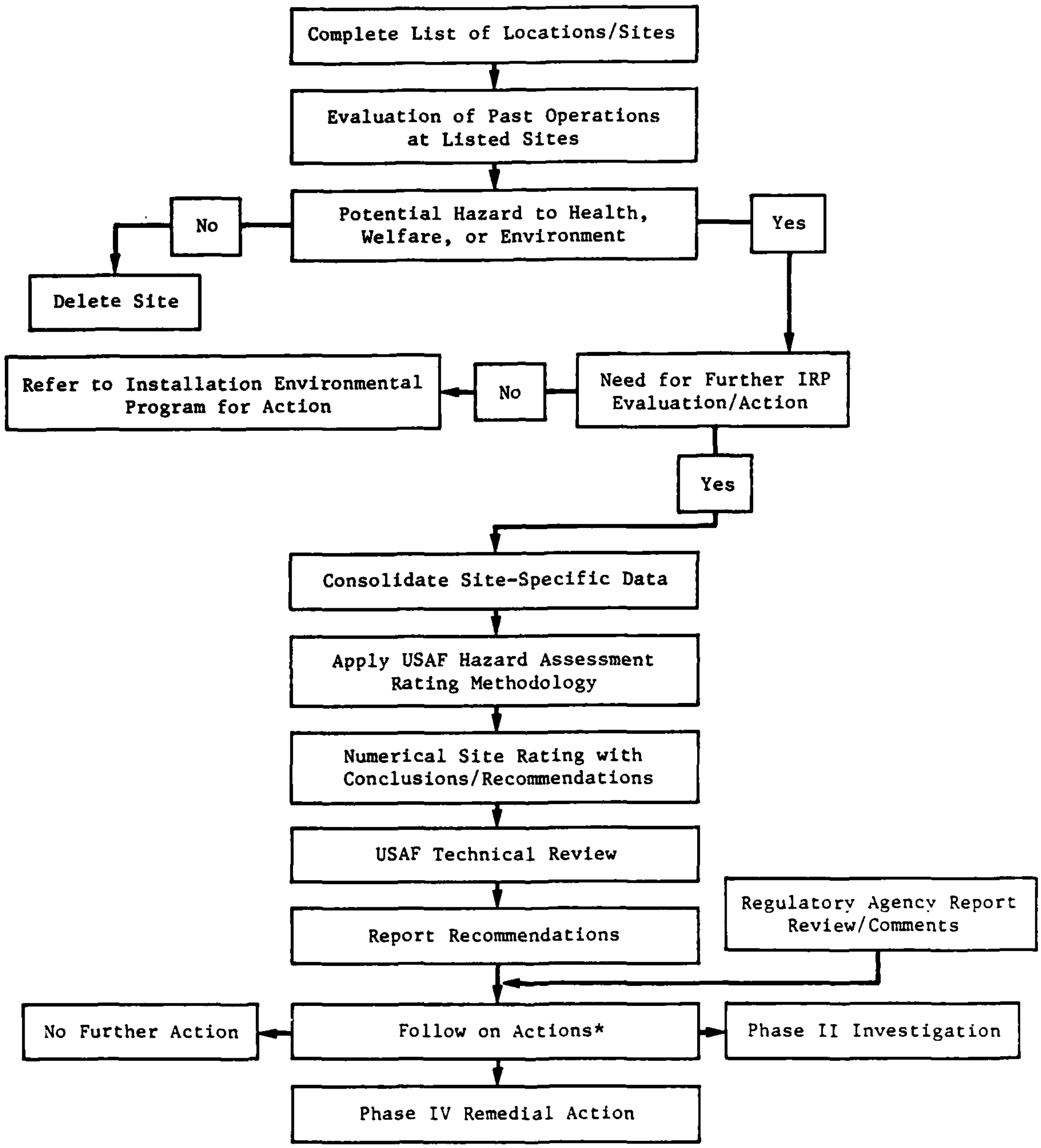
VAFB is currently the third largest USAF installation, occupying more than 98,400 acres (154 square miles) along approximately 35 miles of Santa Barbara County coast. The base varies in width from 5 to 15 miles, and its facilities house more than 40 DOD and non-DOD government organizations and more than 75 civilian aerospace contractors involved in space and missile activities. With approximately 1,000 buildings and 2,080 family housing units onbase, VAFB supports more than 22,300 people. The 6,000-acre cantonment area located in North VAFB provides support for the base's mission and daily operations.

The base is bordered on the west and south by the Pacific Ocean, with the Casmalia Hills to the north and northeast. The city of Lompoc lies 6 miles east of the base boundary. VAFB's north and south sections are separated by the Santa Ynez River.

2.2 HISTORY

In response to the need for more training centers for the rapid development of its armored forces, in March 1941, the War Department selected 90,000 acres centered around Burton Mesa plateau as the site of an artillery training ground. Activated on Oct. 5, 1941, the installation was designated Camp Cooke in honor of Major General Philip St. George Cooke, a pioneer cavalry officer.

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOWCHART



*Beyond scope of Phase I.

SOURCE: ESE, 1984.

Figure 1.3-1
DECISION PROCESS

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

information including: (1) visual evidence of environmental stress, (2) the presence of nearby drainage ditches or surface water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

Using the process shown in Fig. 1.3-1, a decision was then made, based on all of the above information, regarding the potential for hazardous material contamination at any of the identified sites. If no potential existed, the site was deleted from further consideration. If potential for contamination was identified, the potential for migration of the contaminant was assessed based on site-specific conditions. If there were no further environmental concerns, the site was deleted. If the potential for contaminant migration was considered significant, the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in App. H.

ESE performed the onsite portion of the records search during August 1984. The following team of professionals was involved:

- o John D. Bonds, Ph.D., Senior Chemist and Team Leader, 21 years of professional experience.
- o Jeffrey J. Kosik, Engineer, 2 years of professional experience.
- o Julius W. Hunter, Engineer, 3 years of professional experience.
- o Donald F. McNeill, Geologist, 2 years of professional experience.

Detailed information on these individuals is presented in App. B.

1.3 METHODOLOGY

The methodology utilized in the VAFB records search began with a review of past and current industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and current base employees from the various operating areas. Interviewees included 77 current and former personnel associated with the mission of VAFB and tenant organizations onbase. A list of interviewees, by position and approximate years of service, is presented in App. C.

Concurrent with the base interviews, the applicable Federal, state, and local agencies were contacted for pertinent base-related environmental data. The outside records centers and agencies contacted and personnel interviewed are listed in App. C.

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour and helicopter overflight of the identified sites were then made by the ESE Project Team to gather site-specific

1.2 PURPOSE, AUTHORITY, AND SCOPE OF THE ASSESSMENT

The IRP has been developed as a 4-phase program, as follows:

Phase I--Initial Assessment/Records Search
Phase II--Confirmation and Quantification
Phase III--Technology Base Development
Phase IV--Operations/Remedial Actions

Environmental Science and Engineering, Inc. (ESE) conducted the records search at Vandenberg Air Force Base (VAFB), with funds provided by the Strategic Air Command (SAC). This report contains a summary and evaluation of the information collected during Phase I of the IRP and recommendations for any necessary Phase II action.

The objective of Phase I was to identify the potential for environmental contamination from past waste disposal practices at VAFB and to assess the potential for contaminant migration. Activities performed in the Phase I study included the following:

1. Review of site records;
2. Interviews with personnel familiar with past generation and disposal activities;
3. Inventory of wastes;
4. Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal;
5. Definition of the environmental setting at the base;
6. Review of past disposal practices and methods;
7. Performance of field and aerial inspections;
8. Gathering of pertinent information from Federal, state, and local agencies;
9. Assessment of potential for contaminant migration; and
10. Development of conclusions and recommendations for any necessary Phase II action.

1.0 INTRODUCTION

1.1 BACKGROUND

Due to its primary mission, the U.S. Air Force (USAF) has long been engaged in operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sec. 6003 of the Act, Federal agencies are directed to assist the U.S. Environmental Protection Agency (EPA), and under Sec. 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated Dec. 11, 1981, and implemented by USAF message dated Jan. 21, 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DOD policy is to identify and fully evaluate suspected problems associated with past waste disposal practices and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on USAF installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316.

	the area should be conducted using an OVA to determine if any organic vapors are emanating from this area.
Chemical Disposal Site No. 1	It is recommended that soil samples be collected around the washrack area and analyzed for the pesticides included in the U.S. Environmental Protection Agency priority pollutant list. If contaminants are found, removal and disposal of the soil as a hazardous waste may be necessary.
Chemical Disposal Site No. 9	It is recommended that one upgradient and two downgradient monitor wells be installed at this area. Ground water samples should be collected and analyzed for the parameters in List A, Table 6.1-2.
Abandoned Underground Tank Area	It is recommended that a geophysical survey be performed to verify the existence of the underground tanks. Based on the results of this study, one upgradient and two downgradient wells should be installed at locations likely to intercept any underground leakage from the abandoned tanks. Ground water samples should be collected and analyzed for the parameters in List B, Table 6.1-2.

Drum Disposal Site No. 1	Perform a geophysical survey to locate the burial area. Install one downgradient monitoring well adjacent to the disposal site. Sample and analyze the ground water for the parameters in List B, Table 6.1-2.
Landfill No. 11	No well installation or ground water sampling is recommended. A survey of the area should be conducted using an organic vapor analyzer (OVA) to determine if any organic vapors are emanating from this area. In addition, this landfill area should be checked occasionally for erosion and leachate formation.
Landfill No. 5	No well installation or ground water sampling is recommended. A survey of the area should be conducted using an OVA to determine if any organic vapors are emanating from this area. In addition, the area should be checked occasionally to determine if erosion or leachate formation is occurring.
Chemical Disposal Site No. 2	No well installation or ground water sampling program is recommended. This was an oil disposal area which is on/adjacent to Landfill No. 11. A survey of

Landfills No. 3 and No. 4	Perform a geophysical survey to delineate the perimeter of these landfills in order to install the monitor wells outside the landfill area. Install one upgradient and two downgradient monitoring wells. Sample and analyze these wells for the parameters in Lists B, C, and D, Table 6.1-2.
Chemical Disposal Site No. 8	Collect three soil samples in the drainage ditch at the location where waste oil/solvents were disposed of. Collect one background sample in the ditch upgradient of the disposal area. Samples should be analyzed for the parameters in Lists B and E, Table 6.1-2.
Landfill No. 1	Perform a geophysical survey using electromagnetic and/or magnetometer techniques to determine the areal extent of the landfill in order to emplace the monitoring wells outside the area. Install one upgradient and three downgradient wells. Sample and analyze the ground water for the parameters in Lists B, C, and D, Table 6.1-2.
Firefighter Training Area No. 1	Install one upgradient and two downgradient monitor wells. Sample and analyze the ground water for the parameters in Lists B and C, Table 6.1-2.

Chemical Disposal Site No. 6	The VAFB Bioenvironmental Engineering Services (BES) is currently monitoring this area. These studies should be continued as part of the VAFB environmental program.
Chemical Disposal Site No. 7	The VAFB BES is currently monitoring this area. These studies should be continued as part of the VAFB environmental program.
Chemical Disposal Site No. 4	The VAFB BES is currently monitoring this area. These studies should be continued as part of the VAFB environmental program.
Chemical Disposal Site No. 5	The VAFB BES is currently monitoring this area. These studies should be continued as part of the VAFB environmental program.
Chemical Disposal Site No. 3	It is recommended that the lake at this site be sampled and analyzed. The samples should be analyzed for the parameters in List A, Table 6.1-2.

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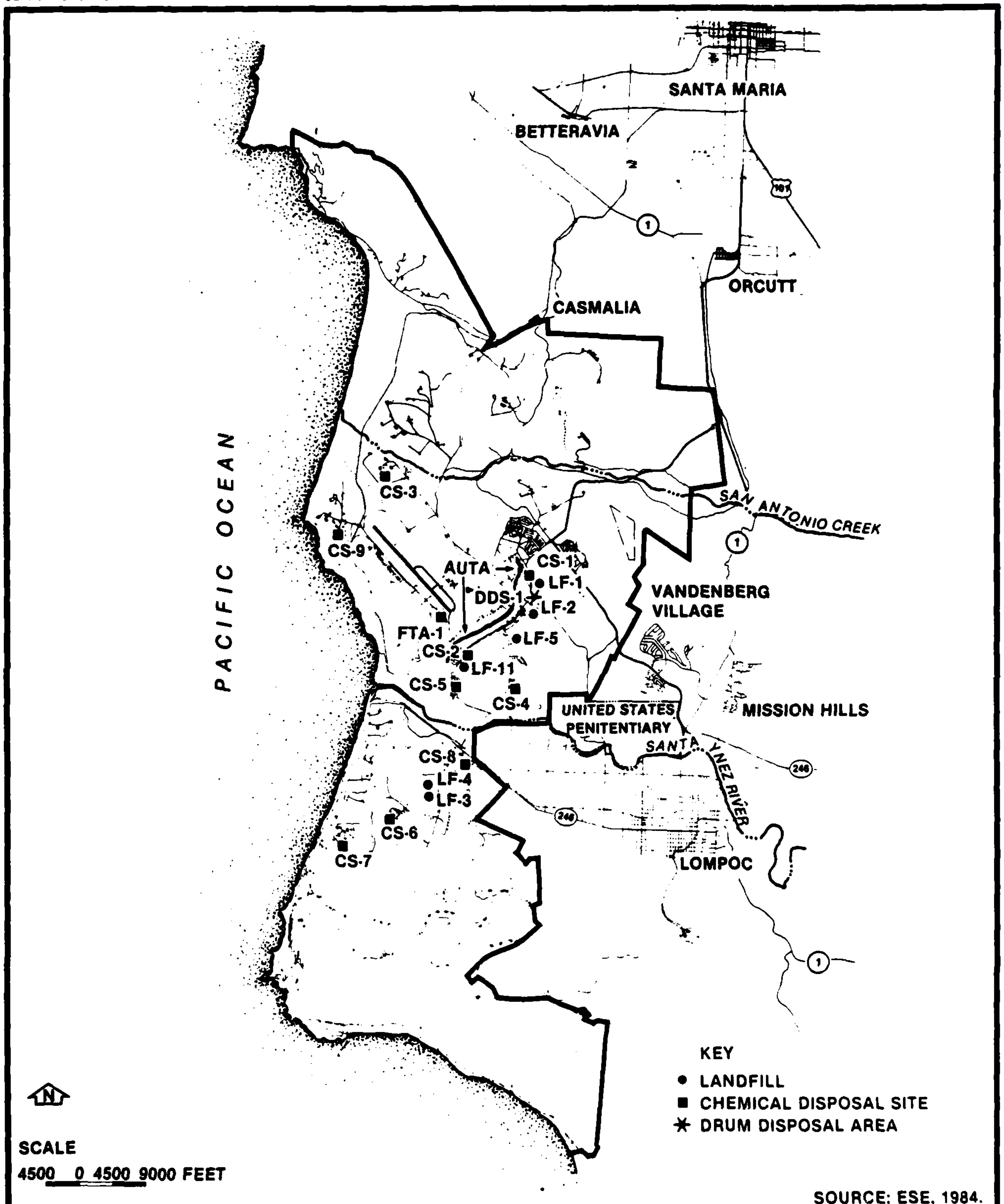

Figure 1
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

Table 1. Priority Ranking of Potential Contamination Sources on VAFB

Rank	Site	Designation	Date of Operation or Occurrence	HARM Score
1	Landfill No. 2	LF-2	1941 - Present	78
2	Chemical Disposal Site No. 6	CS-6	1962 - Present	74
3	Chemical Disposal Site No. 7	CS-7	1962 - Present	74
4	Chemical Disposal Site No. 4	CS-4	1963 - Present	73
5	Chemical Disposal Site No. 5	CS-5	1961 - Present	72
6	Chemical Disposal Site No. 3	CS-3	1960 - 1982	71
7	Landfills No. 3 and 4*	LF-3/LF-4	1959 - 1964	59
8	Chemical Disposal Site No. 8	CS-8	1959 - 1964	58
9	Landfill No. 1	LF-1	1944 - 1959	56
10	Firefighter Training Area No. 1	FTA-1	1942 - Present	53
11	Drum Disposal Site No. 1	DDS-1	1957	50
12	Landfill No. 11	LF-11	1940s - Late 1950s	47
13	Landfill No. 5	LF-5	1944 - 1959	46
14	Chemical Disposal Site No. 2	CS-2	1942 - 1959	46
15	Chemical Disposal Site No. 1	CS-1	1962 - Present	45
16	Chemical Disposal Site No. 9	CS-9	1958 - 1984	44
17	Abandoned Underground Tank Area	AUTA	1941 - Early 1960s	41

*These are separate sites, but due to close proximity, they were combined for ranking and recommendations.

Source: ESE, 1984.

of the rating procedure are presented in App. G. The HARM system is designed to indicate the relative need for followup action (Phase II).

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is a potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites. Eighteen sites were identified at VAFB as having potential for environmental contamination and have been evaluated using the HARM system. The relative potential of the sites for environmental contamination was assessed, and sites which may require further study and monitoring were identified. These sites, dates of operation or occurrence, and the HARM results are given in Table 1. Site locations are shown in Fig. 1. Sites of primary concern are those with higher HARM scores which have a higher potential for environmental contamination and should be investigated in Phase II. Sites of secondary concern are those with lower HARM scores and moderate potential for environmental contamination. Further study at these sites is recommended, but the need for investigation is less than for the sites with higher rankings.

RECOMMENDATIONS

The recommended actions are intended to be used as a guide in the development and implementation of the Phase II study. The detailed recommendations developed for further assessment of environmental areas of concern are presented in Sec. 6.0. These recommendations are summarized as follows:

Landfill No. 2	Monitor wells are currently in place at the landfill. It is recommended that Well 13 be redrilled and screened to a depth of 5 to 65 ft. One additional well should be installed between Wells 12 and 13. All wells around the landfill should be sampled and analyzed for the parameters in List A, Table 6.1-2.

From February 1942 until the end of World War II, armored and infantry divisions were trained at Camp Cooke in preparation for combat. A prisoner of war camp was established at Camp Cooke in 1944 to house German and Italian prisoners. In 1945, a maximum security Army Disciplinary Barracks (now the U.S. Penitentiary, Lompoc) was constructed on post property to confine military prisoners from throughout the Army.

After deactivation of Camp Cooke in June 1946, most of the base was leased for agriculture and grazing. The camp was reactivated for 2.5 years after the outbreak of the Korean Conflict in 1950 and deactivated again in February 1953.

In 1956, the Camp Cooke site was chosen by DOD to be USAF's first missile base. In June 1957, North Camp Cooke was transferred to USAF and redesignated Cooke Air Force Base (AFB). The southern portion of Camp Cooke was assigned to the Navy and redesignated Point Arguello Naval Missile Facility. Cooke AFB was redesignated VAFB in October 1958, in honor of General Hoyt S. Vandenberg, the second Air Force Chief of Staff. In 1964, the Defense Reorganization Act resulted in the tran r of the Point Arguello Naval Missile Facility to USAF.

In December 1958, the first missile was launched from VAFB. Since then, more than 1,500 ICBMs and polar-orbiting satellites have been launched from VAFB. Currently, VAFB is the only U.S. military installation that actively launches ICBMs and satellites.

2.3 MISSION AND ORGANIZATION

Since 1958, VAFB has operated with the dual mission of a missile test base and an aerospace center. It is the headquarters of the 1st Strategic Aerospace Division (1STRAD), Strategic Air Command. VAFB's major tenant is the Western Space and Missile Center (WSMC) of the Space and Missile Test Organization (SAMTO), which operates the Western Test Range for the Air Force Systems Command (AFSC).

1STRAD's primary mission is to conduct SAC missile combat crew training, operational testing, and other intercontinental ballistic missile (ICBM) and space-related programs. 1STRAD exercises command jurisdiction over the 4315th Combat Crew Training Squadron (CCTS), the 394th Intercontinental Ballistic Missile Test Maintenance Squadron (ICBMTMS), and the USAF Hospital.

1STRAD relies on the 4392nd Aerospace Support Group (AEROSG) to provide the services of a host base. The 4392nd AEROSG consists of 5 squadrons--Security Police, Supply, Civil Engineering (CES), Transportation, and Headquarters--and 14 staff agencies: Resource Manager, Comptroller, Data Automation, Contracting, Operations and Training, Administration, Personnel, Chaplain, Staff Judge Advocate, Public Affairs, Social Actions, Services, Disaster Preparedness, and the Morale, Welfare, and Recreation Division.

The primary tenants on VAFB include the 3901st Strategic Missile Evaluation Squadron (SMES), the Air Force Logistics Command (AFLC) Support Group, the National Aeronautics and Space Administration (NASA) Kennedy Space Center, the U.S. Army Corps of Engineers (COE), Field Training Detachment (FTD) 530, the 1369th Audiovisual Squadron (AVS), Det. 8 of the 37th Aerospace Rescue and Recovery Squadron (ARRS), and the 392nd Communications Group (CG).

Civilian contractors providing support to VAFB include Bionetics; Rockwell International; Martin-Marietta Corporation; International Telephone and Telegraph-Federal Electric Corporation (ITT-FEC); Lockheed Missile and Space Company; Stearns-Rodgers, Inc.; General Dynamics; and Boeing Aerospace Corporation.

Descriptions of these organizations and tenants and their missions are presented in App. D.

3.0 ENVIRONMENTAL SETTING

3.1 METEOROLOGY

The climate at VAFB is categorized as a subtropical (Mediterranean) climate. Subtropical climates commonly occur along the midlatitude west coasts of continents and have a modest amount of precipitation during the winters, with nearly or completely dry summers. The climate of VAFB is typical of the subtropical category, with year-round mild temperatures that shift through gradual transitions without clearly defined seasons. This climate is primarily due to three features: a persistent, broad high-pressure cell located in the eastern Pacific Ocean, coastal topography, and the Pacific Ocean. The high-pressure system is most predominant during the late spring, summer, and early fall, when it remains stationed offshore and produces dry weather, a stable atmosphere, and strong, frequent inversions. During winter, the high-pressure system migrates southward, enabling Pacific storms to bring rain to the region. Climatological data for VAFB are summarized in Table 3.1-1. These data were collected at the VAFB Airfield over a 31-year period of record (June 1952 to December 1983).

The average annual rainfall at VAFB is 15.5 inches, 84.5 percent of which occurs from November through April at a rate of approximately 2 inches per month. Historically, the largest amount of precipitation occurs in January (maximum of 9.3 inches) and the least amount of precipitation occurs in July (maximum of 0.1 inch).

Both the annual temperature and relative humidity regimes at VAFB are strongly influenced by the proximity of the installation to the relatively cool offshore California ocean current. These maritime influences produce strong tempering effects on both temperature and moisture content of the air. Year-round, the curves of the monthly means are relatively flat, with little range to the extremes.

Table 3.1-1. Summary of Climatological Data for VAFB*

Parameter	Month												Annual
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Winds (knots)													
Prevailing	ESE6	NNW7	NW7	NW7	NW7	NW7	NW5	NW5	NW5	NW5	ESE6	ESE6	NW6
Peak Gusts	48	54	41	40	37	36	37	32	32	36	52	44	48
Temperature (°F)													
Extreme Maximum	83	83	87	90	93	98	85	96	100	99	87	87	100
Mean Maximum	61	60	60	61	61	63	64	66	68	69	65	61	63
Mean Minimum	44	45	46	47	49	52	53	54	54	52	48	44	49
Extreme Minimum	25	31	32	36	39	42	45	45	43	35	32	26	25
Relative Humidity (%)													
0400 LST	79	83	82	82	88	89	90	90	82	78	76	77	83
1300 LST	60	63	64	64	67	68	69	68	67	62	56	55	64
Precipitation (inches)													
Maximum	9.3	9.2	6.1	4.6	2.7	0.3	0.1	1.0	2.3	2.6	6.3	5.5	25
Mean	3.0	2.7	2.1	1.4	0.3	0.1	T	0.1	0.4	0.7	1.9	2.0	15.5
Minimum	0.0	0.1	T	T	T	0	0	0	0	T	0	0.2	4.7
24-Hour Maximum	2.3	2.1	2.2	1.5	2.1	0.1	0.1	0.9	1.7	1.5	1.5	3.0	N/A
Fog													
Mean Number of Days Visibility ≤7 miles	10	11	12	14	18	22	28	28	22	19	13	11	208

* Location: Vandenberg AFB, Calif., N34°43', W120°34'.
Elevation: 36 ft.
Period of Record: June 1952 - Dec. 1983.

NOTES: LST = Local Standard Time.
T = trace.

Source: 4392nd AEROSG, 1984.

The monthly mean maximum temperatures are fairly consistent, varying from 60°F in February and March to 69°F in October. The monthly mean minimum temperatures vary from 44°F in December and January to 54°F in August and September. Recorded temperature extremes include 100°F in September and 25°F in January. The relative humidity averages from 76 to 90 percent in the morning, with a yearly average of 83 percent. During the afternoon, the relative humidity drops between 55 and 64 percent, with a mean annual average of 64 percent.

Spring, summer, and fall are characterized by northwesterly winds with speeds averaging 5 to 7 miles per hour (mph). During November, December, and January, the prevailing winds are from the east-southeast at speeds averaging 6 mph.

3.2 GEOGRAPHY

3.2.1 PHYSIOGRAPHY

The main cantonment area of VAFB is located on Burton Mesa, a low-lying plateau with an elevation of approximately 400 feet (ft). The plateau is surrounded by steep canyons that lead north to San Antonio Creek, south to the Santa Ynez River, and west to the Pacific Ocean (4392nd AEROSG, 1977). VAFB lies partly in the Southern Coast Ranges Province, on north-south trending range, and partly in the Transverse Ranges Province, on east-west trending range (Dept. of the Air Force, 1976). The principal mountain range in the vicinity of VAFB is the Santa Ynez Mountains to the south, with an elevation of 2,150 ft mean sea level (msl). The Purisima Hills are situated north of the cantonment area, with an elevation of approximately 1,500 ft msl.

3.2.2 SURFACE HYDROLOGY

VAFB lies within two mountainous physiographic provinces which strongly influence the surface hydrology of the region. VAFB is located on Burton Mesa, which is drained by a series of canyons that run north, south, and west. The base can be divided into two major drainage basins--the San Antonio Creek and the Santa Ynez River. Surface water

flow follows well-defined seasonal patterns, with high discharge and flooding occurring from November through May and very little or no discharge occurring in the drier months. Seasonal streams that occur on VAFB are: Shuman Creek, San Antonio Creek, Canada Tortuga, Santa Ynez River, Bear Creek, Canada Honda Creek, and Jalama Creek. Several small, still-water permanent streams and ponds also occur on VAFB. Surface water drainages are shown in Fig. 3.2-1.

3.3 GEOLOGY

3.3.1 GEOLOGIC SETTING

VAFB is underlain predominantly by marine sedimentary rocks of Late Mesozoic age (140 to 70 million years before the present) and Cenozoic age (70 million years to the present). Fig. 3.3-1 shows the surficial geologic units exposed in the cantonment area of VAFB. (The geologic symbols used in Fig. 3.3-1 are explained in Table 3.3-1.) The basal unit underlying the entire base is the Franciscan Formation of upper Jurassic age (Dibblee, 1950). The Franciscan Formation consists of a series of sedimentary and volcanic rocks with numerous serpentine intrusions. Extensive folding and faulting throughout the VAFB area has formed four major structural provinces: the Santa Ynez range, the Lompoc lowland, the Los Alamos syncline, and the San Rafael Mountain uplift. The Santa Ynez range consists of a very thick Cretaceous-Tertiary sedimentary section uplifted along the Santa Ynez fault and subsequently folded. The Lompoc lowland is an area of low relief that is structurally synclinal but has Franciscan basement relatively close to the surface. The Los Alamos syncline is a deep structural downwarp traversing the Los Alamos and upper Santa Ynez valleys. The San Rafael Mountains have been uplifted by faulting along the southwestern margin of the mountain range. The majority of folds in these structural provinces are oriented to the northwest. The regional compressive forces are believed to have acted in a counterclockwise rotational direction (Dibblee, 1950).

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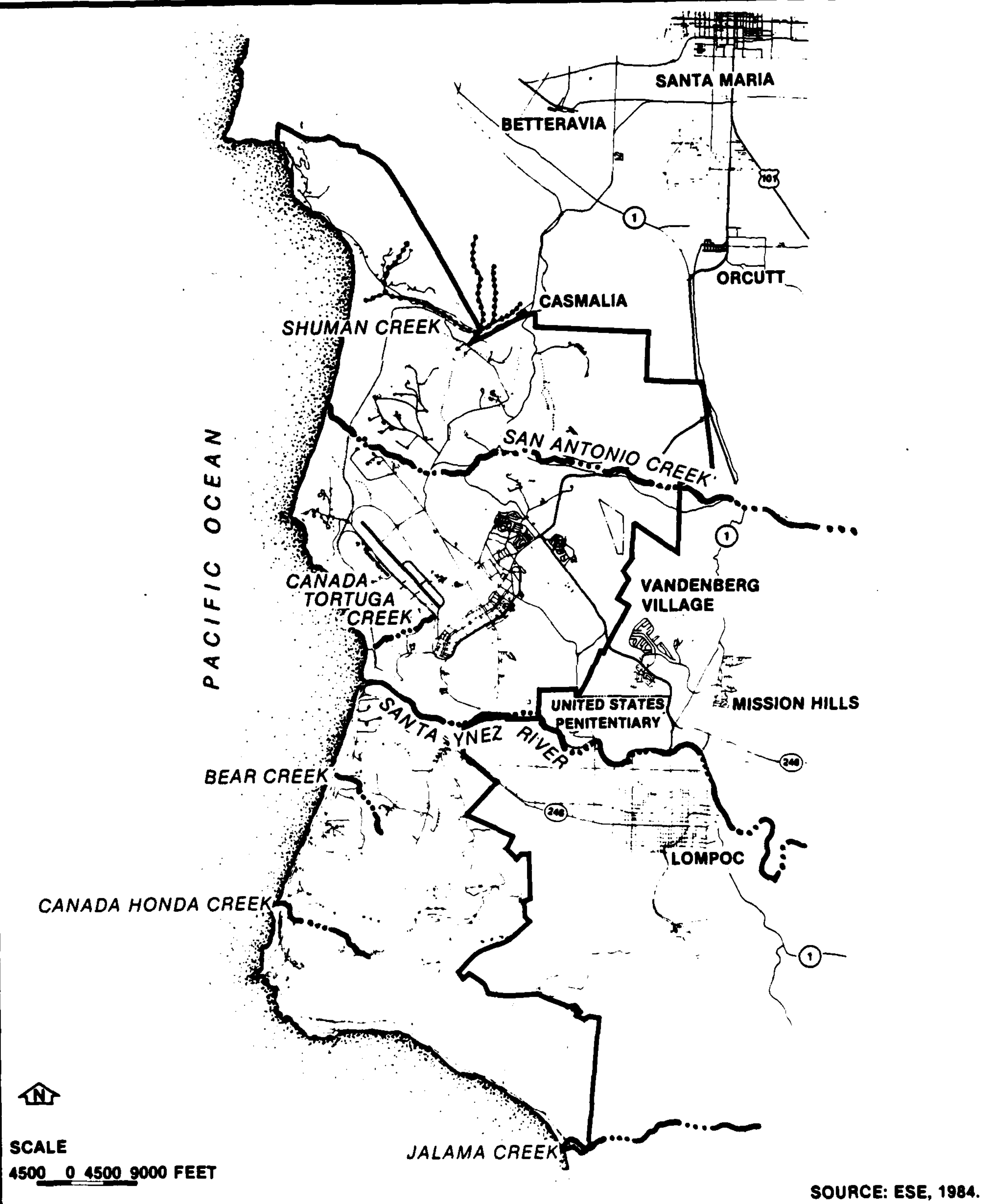

Figure 3.2-1
SURFACE WATER DRAINAGES
ON VAFB

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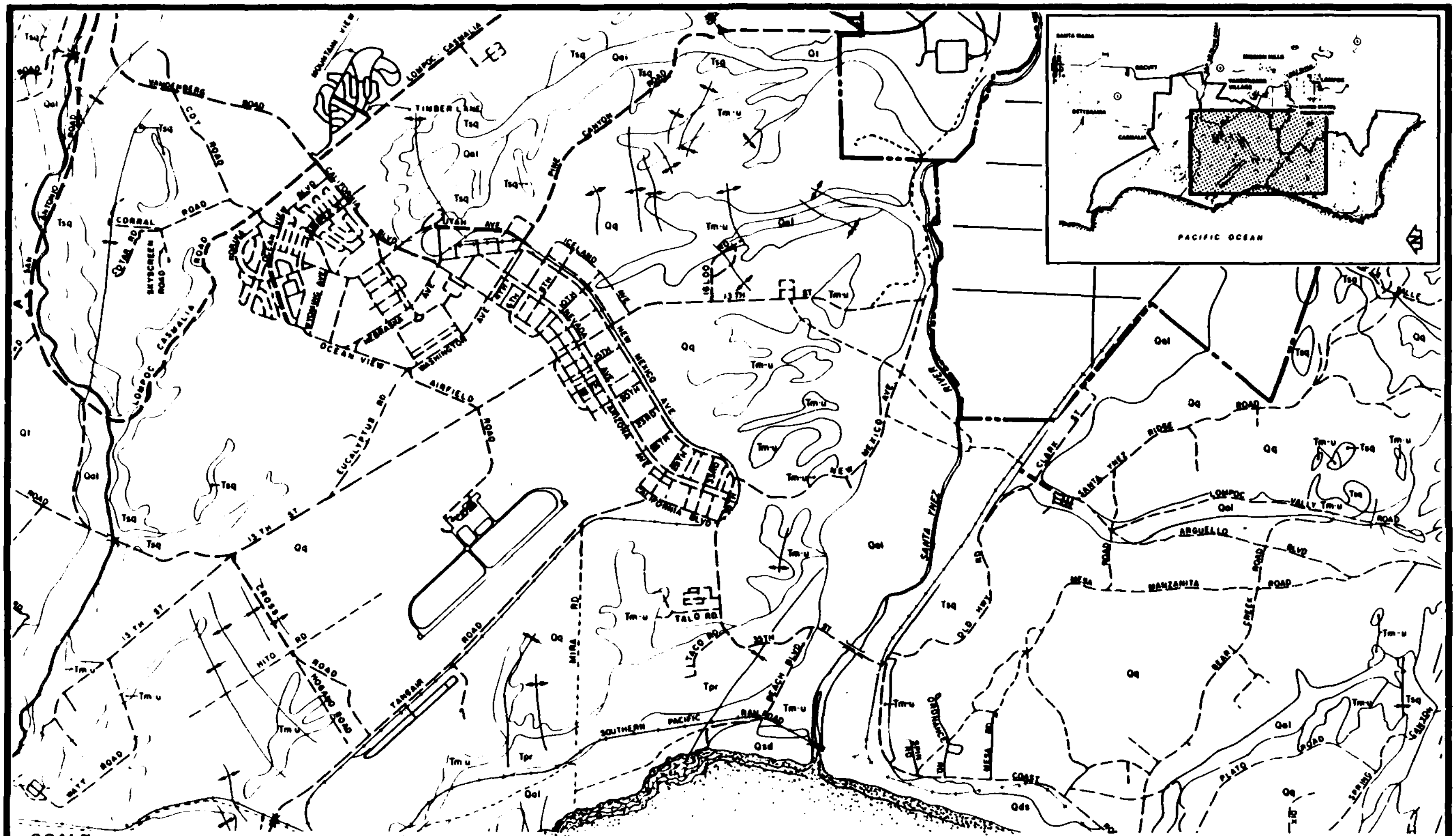

SCALE
3000 0 3000 6000 FEET

N

NOTE: SEE TABLE 3.3-1 FOR EXPLANATION OF GEOLOGIC SYMBOLS.

SOURCE: Department of the Air Force, 1966a.

Figure 3.3-1
GEOLOGIC MAP OF CANTONMENT AREA

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Table 3.3-1. Geologic Symbols

Symbol	Formation
Qal	Alluvium
Qds	Dune Sand
Qt	Terrace
Qq	Orcutt (wind-blown sand; locally indurated; basal pebble conglomerate)
Tpr	Paso Robles (shale-pebble conglomerate; green silt and clay; sand; freshwater limestone beds; nonmarine)
Tca	Careaga (upper portion--Graciosa member; loose buff sand; locally pebbly; shell reefs at or near base; marine) (lower portion--Cebada member; fine-grained buff sand; marine)
Tsq	Sisquoc (white-weathering, massive impure diatomite; diatomaceous shale; pure laminated diatomite; marine)
Tm-u	Monterey-Upper (hard, laminated platy siliceous shale; cherty shale; diatomite lenses; marine)
Tm-l	Monterey-Lower (hard, laminated platy siliceous shale; soft, thin-bedded shale; phosphatic shale; limestone beds; marine)

Source: Dept. of the Air Force, 1966a.

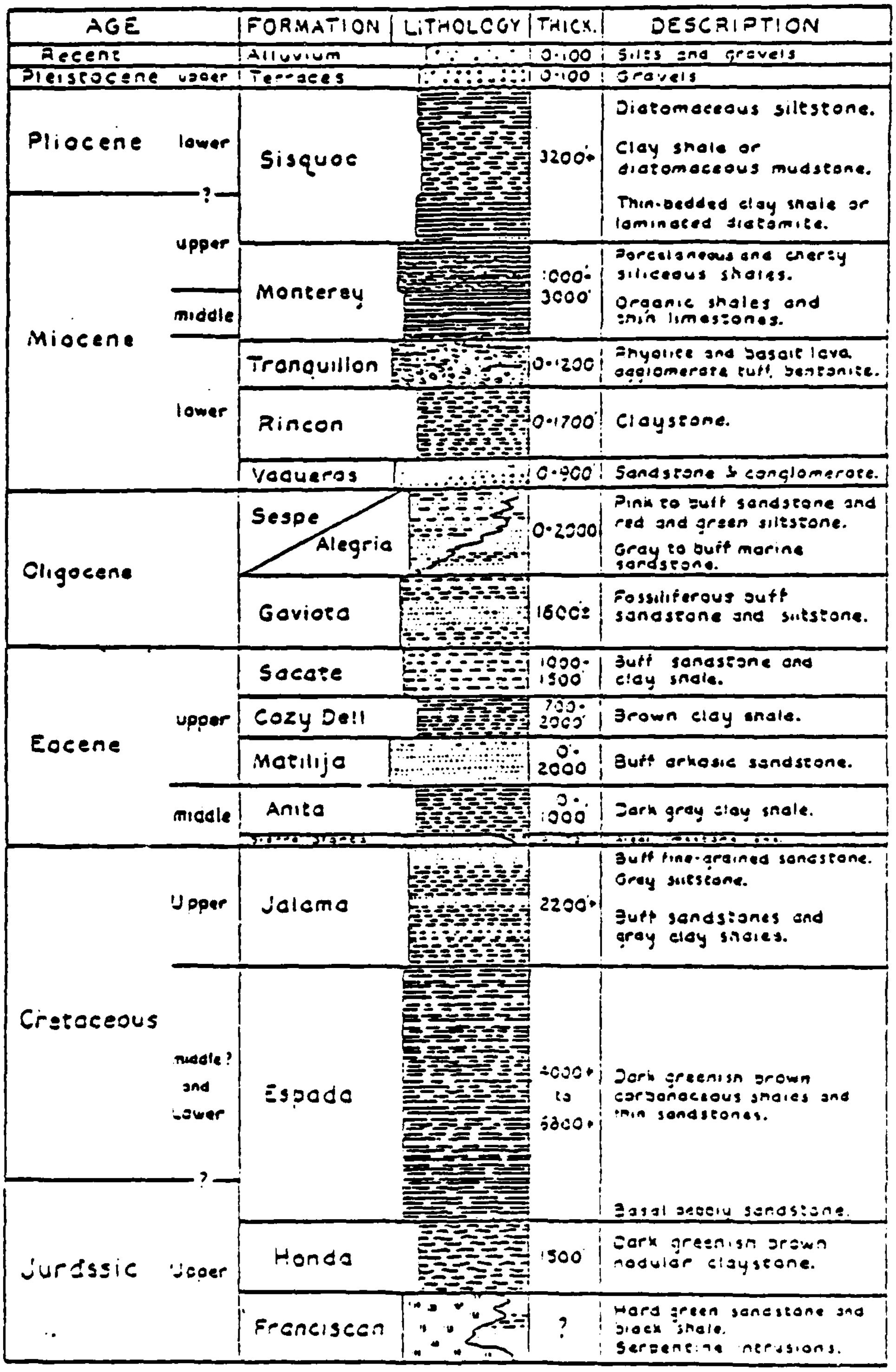
Stratigraphically, the Mesozoic and Cenozoic marine sedimentary rocks that overlie the Franciscan basement can be divided into two stratigraphic provinces--the Santa Ynez Mountains and the Santa Maria Basin. Figs. 3.3-2 and 3.3-3 show typical stratigraphic sections for the respective provinces. Formations encountered in the Santa Ynez Mountains were deposited in the Santa Barbara embayment from Cretaceous to Pliocene time. The Santa Maria Basin developed during Miocene time and had sediment accumulation during the Pliocene and Pleistocene ages. The Santa Maria Basin shows Cretaceous and Miocene shales and sandstones overlain by Pliocene and Pleistocene clays, shales, sands, and coarse gravels. These sequences are overlain by Pleistocene terrace deposits with Recent alluvium and eolian sands.

The typical section for the western Santa Ynez Mountains shows the basal Franciscan Formation overlain by Cretaceous sandstone and shales. The Cenozoic units consist of alternating sandstone, shale, and siltstone with some basalts and lavas found in Miocene age deposits. Pleistocene sedimentation consisted of reworked gravel and sand units deposited in fluvial and coastal terrace environments. The youngest deposits in this province consist of alluvium formed by recent river sedimentation and physical weathering.

3.3.2 SOILS

The U.S. Soil Conservation Service (SCS, 1972) has mapped and identified the soils on VAFB. Six regional soil associations are present on the north-central sections of VAFB: Sorrento-Mocho-Camarillo, Tangair-Narlon, Marina-Oceano, Chamise-Arnold-Crow, Shedd-Santa Lucia-Diablo, and Duneland.

The Sorrento-Mocho-Camarillo association consists of sandy to silty clay loams on flood plains and alluvial fans. The soils exhibit good to poor drainage and occur on nearly level to moderate slopes. The Tangair-Narlon association is found on nearly level to strongly sloping, poorly to moderately well-drained sands and loamy sands.



SOURCE: DIBBLEE, 1950.

Figure 3.3-2
STRATIGRAPHIC SECTION FOR THE SANTA YNEZ MOUNTAINS

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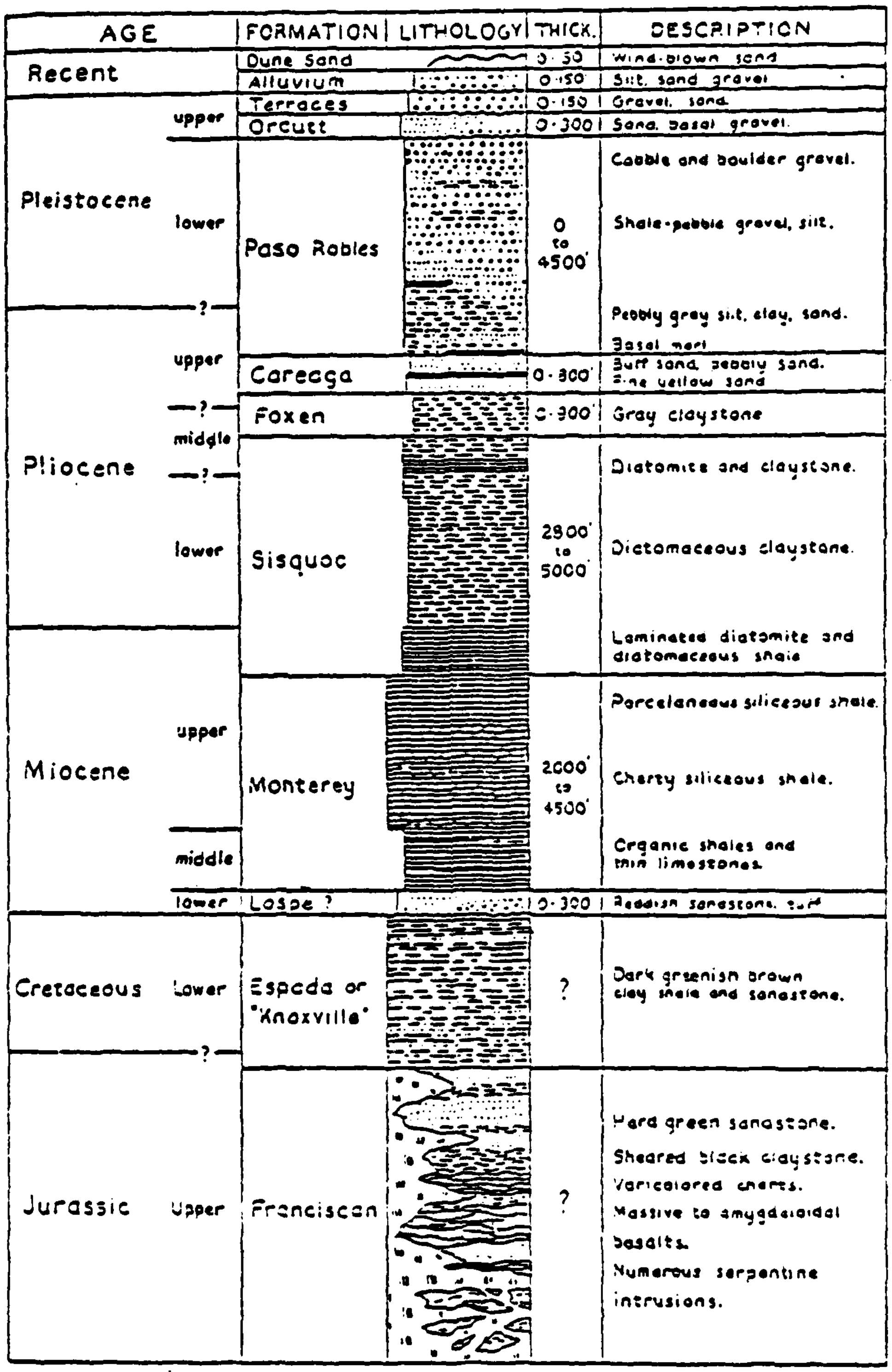

SOURCE: DIBBLEE, 1950.

Figure 3.3-3
STRATIGRAPHIC SECTION FOR THE SANTA MARIA BASIN

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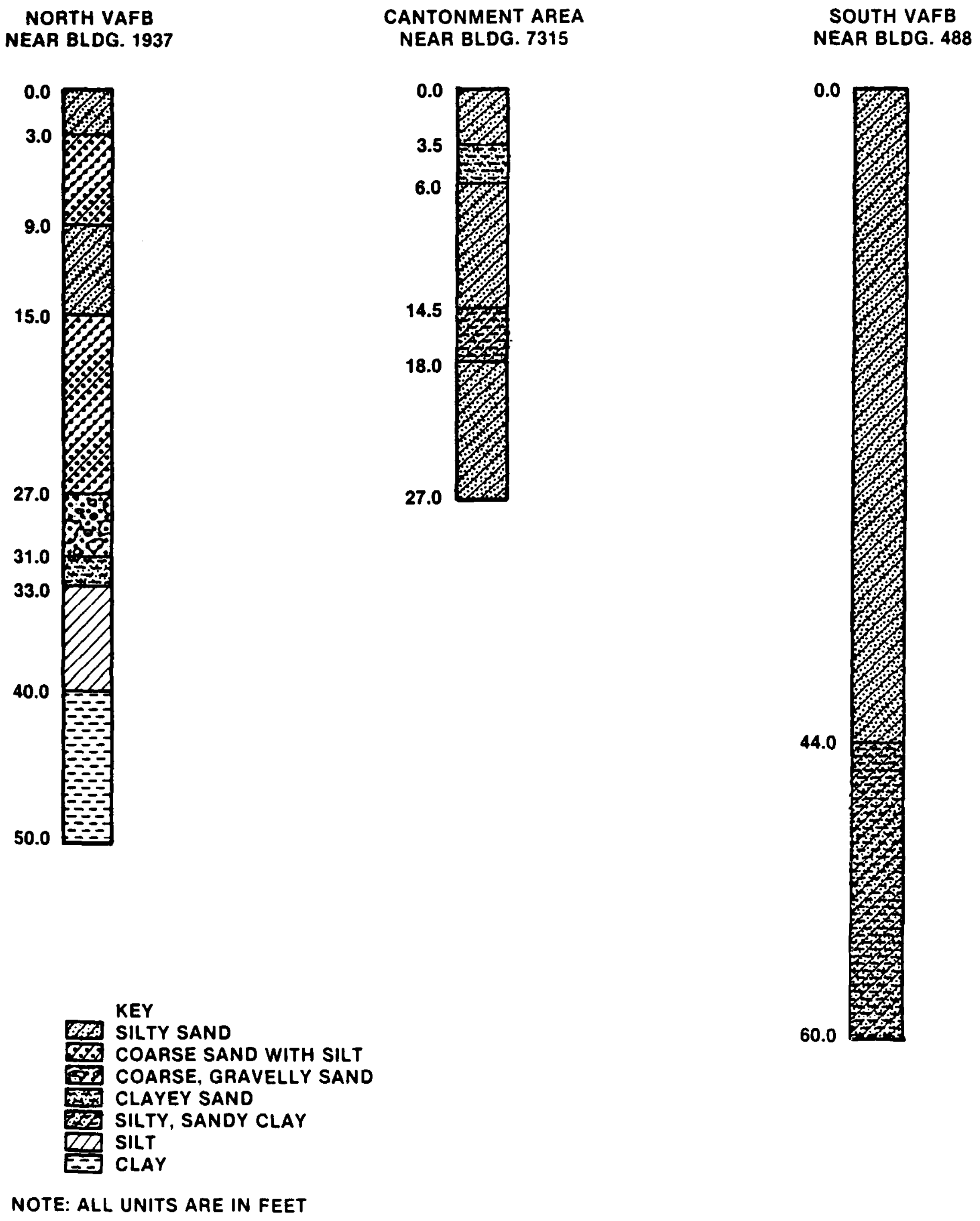
The Marina-Oceano association consists of predominantly sand that exhibits level to moderately steep slopes and excessive drainage. This association is usually encountered on mesas and dune areas. The Chamise-Arnold-Crow association is found on gently sloping to very steep, well to excessively drained sands to clay loams. This soil type is usually limited to higher terraces and upland areas. The Shedd-Santa Lucia- Diablo association occurs on upland areas that have steep slopes and are well drained. The soil consists of shaly clay loams and silty clays. The Duneland association is represented by coarse to medium sand found along or in close proximity to the coastal areas on VAFB. This soil can occur as either beaches or dunes.

Shallow soil borings obtained from foundation studies for buildings at VAFB were used to present typical shallow soil profiles (see Fig. 3.3-4). The borings show a series of alternating and mixed sand and silt layers. The majority of borings available for the cantonment area show similar silt-sand units underlain by clay and weathered shale.

3.3.3 GEOHYDROLOGY

Regional Ground Water Regime

Ground water occurrences in the VAFB region can be divided into two classes, depending on the nature of the aquifer. A consolidated aquifer system is present beneath VAFB and can yield appreciable quantities of water from larger fractures and joints. This system consists of the Knoxville, Tejon, Sespe, Vaqueros, Rincon, Monterey, Foxen, and Sisquoc Formations. The second aquifer system consists of unconsolidated alluvial and fluvial sand and gravel deposits. This system consists of the Careaga, Paso Robles, and Orcutt Formations of Pliocene and Pleistocene age, with Recent river channel and eolian deposits. Within VAFB, three regional aquifers are used for potable water: the Santa Ynez Aquifer, the San Antonio Aquifer, and the Lompoc Terrace Aquifer (see Fig. 3.3-5).



SOURCE: ESE. 1984.

Figure 3.3-4
TYPICAL SHALLOW SOIL PROFILES

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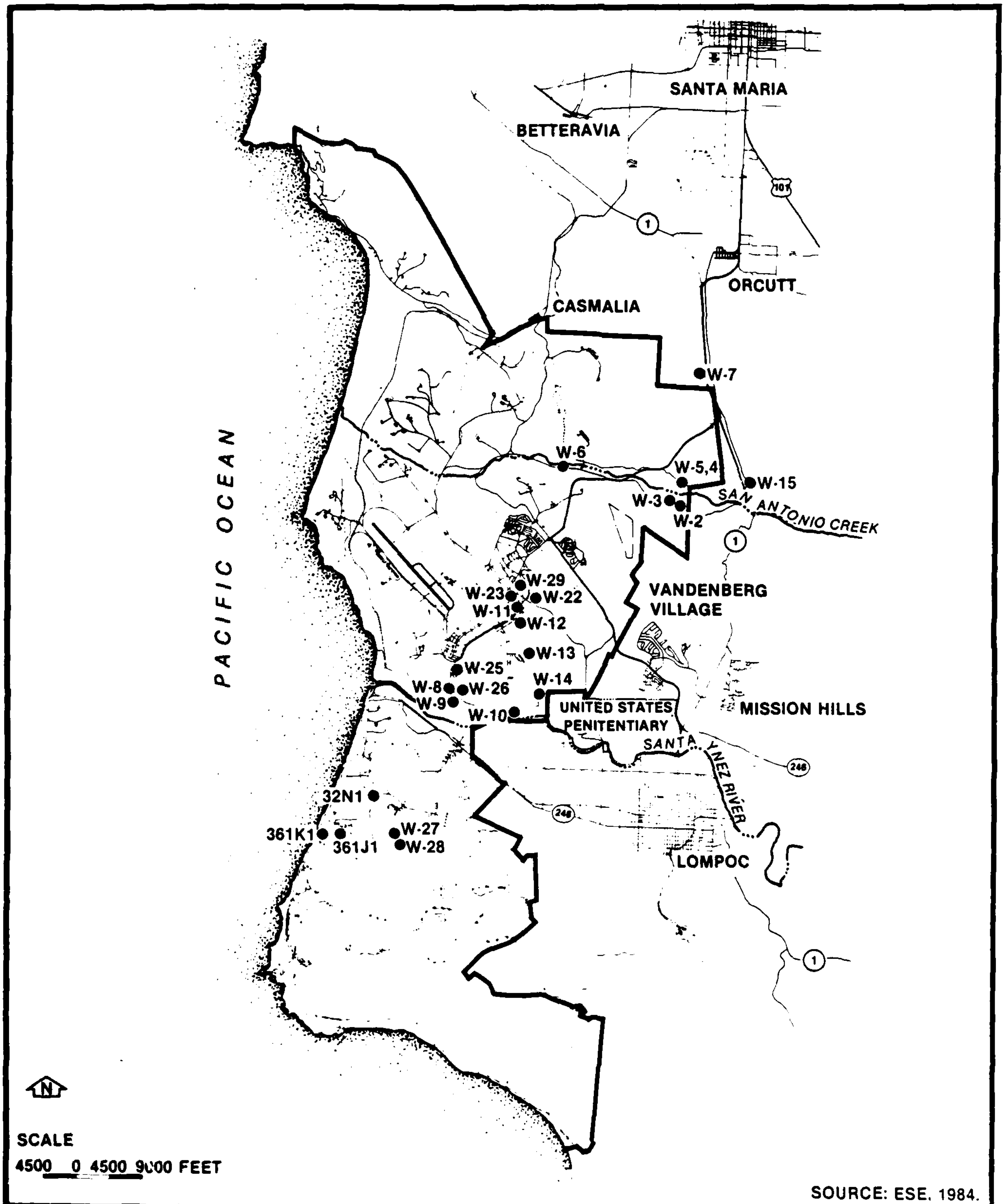

Figure 3.4-2
MONITOR WELL LOCATIONS
THROUGHOUT THE BASE

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Vandenberg Air Force Base

3.4.2 GROUND WATER QUALITY

As described in Sec. 3.3, VAFB draws water from three aquifer systems. The 10 potable wells are monitored for a series of inorganic, organic, pesticide, and herbicide water quality parameters. Water quality data for the potable water supply wells at VAFB are available at the Bioenvironmental Engineering Services (BES) Office. Available analyses include the health-related National Interim Primary Drinking Water Regulations (NIPDWR) compounds and EPA National Secondary Drinking Water Regulation (NSDWR) parameters. In general, the South Vandenberg well field water quality is within primary and secondary drinking water standards. The Santa Ynez well field water quality conforms to NIPDWR water quality standards, except for Well 3, which has shown excessive chromium values. Samples from Santa Ynez Well 6 have shown trace amounts of a number of pesticides, although those results have been intermittent and unduplicated. The San Antonio ground water meets or exceeds NIPDWR standards and is considered overall good quality water.

In addition to the potable wells, 24 monitoring wells are located on VAFB (see Fig. 3.4-2) to monitor ground water quality in a number of industrial areas. The well locations, siting rationale, and sampling frequency are given in Table 3.4-3. Water quality in the vicinity of the existing sanitary landfill (Landfill No. 2) is monitored by a series of upgradient and downgradient wells (see Fig. 3.4-3). Samples from Wells 22 and 23 (W-22 and W-23), located upgradient of Landfill No. 2, indicate background water quality values. However, samples from Well 23 have contained a number of volatile organics (Table 3.4-4). This contamination may be from drycleaning, motor pool, and washrack operations formerly performed in the vicinity. Well 11 (W-11) is located within fill material on the upgradient side. Samples from Well 11 indicate high manganese values, high organic carbon levels, and the presence of several volatile organics (Table 3.4-4), which may represent contamination by landfill leachate.

Table 3.4-2. Surface Water Quality Data From VAFB Surface Water Sampling Locations (SWS-12 through SWS-16) (Continued, Page 3 of 3)

Parameter	SWS-12		SWS-13		SWS-14		SWS-15		SWS-16	
	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples
Water Temperature (°C)	11-16	2	16	1	16	2	9-13	2	9.5-21	7
pH	7.5-8.3	2	8.4	1	8.4	2	7.3-7.9	2	6.6-7.1	7
Dissolved Oxygen	8.9-11.5	2	9.8	1	9.4-11.0	2	9.1-11.5	2	1.3-9.5	
Chemical Oxygen Demand (mg/1)	40-84	2	13	1	<10-30	2	53-74	2	180-390	7
Nitrate (mg/1)	2.5-9.2	2	0.6	1	0.5-9.4	2	<0.1-1.5	2	<0.1-0.98	7
Oil and Grease (mg/1)	0.3-0.7	2	0.8	1	<0.3-1.1	2	<0.3	2	<0.3-13.2	7
Total Phosphorus (mg/1)	2.7	1	0.2	1	0.9-1.7	2	1.0-1.8	2	—	
Total Chromium (ug/1)	<50-70	2	<50	1	<50	2	<50	2	<50	2
Iron (ug/1)	1,300-4,800	2	150	1	1,800-5,300	2	364-1,200	2	55,340-189,200	7
Lead (ug/1)	<20-24	2	15	1	<20	2	<20-<50	2	<20	2
Sodium (mg/1)	46-207	2	285	1	96-130	2	150-210	2	89.4-463.6	2
Zinc (ug/1)	80-1,460	2	<50	1	<50	2	<50	2	—	
Alkalinity (Total)	72-215	2	400	1	130-320	2	248-280	2	598-862	6
Chloride (mg/1)	47-360	2	215	1	97-130	2	272-440	2	80-700	6
Total Dissolved Solids (mg/1)	280-1,240	2	950	1	580-830	2	886-1,260	2	1,834-2,296	7
Sulfate (mg/1)	48-100	2	120	1	160-180	2	90-140	2	5-34	7

Source: USAF Hospital, 1983.

Table 3.4-2. Surface Water Quality Data From VAFB Surface Water Sampling Locations (SWS-6 through SWS-10) (Continued, Page 2 of 3)

Parameter	SWS-6		SWS-7		SWS-8		SWS-9		SWS-10	
	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples
Water Temperature (°C)	11-15	2	11.5-16	2	14-19	2	21.5	1	24	1
pH	8.3-8.7	2	8.2-8.5	2	7.9-8.4	2	8.49	1	8.79	1
Dissolved Oxygen	9.5-11	2	9.2-11.0	2	9.1-10.5	2	10.0	1	10.2	1
Chemical Oxygen Demand (mg/1)	<10-59	2	17-145	2	<10-77	2	110	1	32	1
Nitrate (mg/1)	0.04-1.6	2	0.08-0.52	2	2.9	1	2.0	1	1.1	1
Oil and Grease (mg/1)	0.3	2	<0.3-0.7	2	0.8-1.4	2	0.9	1	0.4	1
Total Phosphorus (mg/1)	0.2-1.6	2	0.1-0.6	2	0.02-6.5	2	0.9	1	0.3	1
Total Chromium (ug/1)	<50	2	<50	2	<50-76	2	<50	1	<50	1
Iron (ug/1)	140-2,100	2	100-450	2			300	—	<100	1
Lead (ug/1)	<20-24	2	<20	2	<20-63	2	40	1	30	1
Sodium (mg/1)	77-110	2	80-110	2	219-220	2	243	1	250	1
Zinc (ug/1)	<50	2	<50	2	<50-80	2	<50	1	<50	1
Alkalinity (Total)	330-360	2	300-350	2	290-360	2	210	1	310	1
Chloride (mg/1)	53-160	2	97-115	2	230-310	2	390	1	350	1
Total Dissolved Solids (mg/1)	830-1,090	2	860-890	2	1,900-2,060	2	1,925	1	1,240	1
Sulfate (mg/1)	290-360	2	260-350	2	800-930	2	810	1	120	1

Table 3.4-2. Surface Water Quality Data From VAFB Surface Water Sampling Locations (SWS-1 through SWS-5)

Parameter	SWS-1		SWS-2		SWS-3		SWS-4		SWS-5	
	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples	Range	No. of Samples
Water Temperature (°C)	10-15.5	6	11-15	6	10-14	6	11-16	4	15-19	2
pH	7.81-8.16	6	7.4-8.0	6	7.6-8.2	6	8.1-9.0	4	6.5-8.6	2
Dissolved Oxygen	9.6-12.3	6	6.0-11.0	6	9.8-11.2	6	8.0-11.8	4	10.4-11.0	2
Chemical Oxygen Demand (mg/1)	3.6-71	4	20-120	4	20-180	4	3-80	4	<10-12	2
Nitrate (mg/1)	0.4-4.6	6	0.38-5.6	6	0.2-3.5	6	0.44-2.0	4	0.7-2.9	2
Oil and Grease (mg/1)	0.6-2.5	6	<0.3-0.8	5	<0.3-0.5	6	<0.3-1.0	3	<0.3	2
Total Phosphorus (mg/1)	0.22-2.2	4	1.0-4.6	6	<0.1-3.0	6	0.34-2.1	4	0.6-1.9	2
Total Chromium (ug/1)	<50	6	<50	6	<50	6	<50	4	<50	2
Iron (ug/1)	310-8,780	6	490-3,807	6	884-3,305	6	1,840-9,250	3	70	1
Lead (ug/1)	<20-46	6	<20-36	6	<50	6	<20	3	<20	2
Sodium (mg/1)	140-430	6	157-665	6	210-404	6	41-220	4	46-49	2
Zinc (ug/1)	<50	6	<50	6	<50	6	<50	4	<50	2
Alkalinity (Total)	185-410	6	210-430	6	152-320	6	190-230	4	310-330	2
Chloride (mg/1)	150-460	6	212-920	6	300-900	6	24-240	4	60-70	2
Total Dissolved Solids (mg/1)	820-2,100	6	1,400-3,600	6	—		602-1,180	4	700	2
Sulfate (mg/1)	260-560	6	260-620	6	106-900	6	52-340	4	170-180	2

Table 3.4-1. Surface Water Sampling Locations, Siting Rationale, and Sampling Frequency

Sampling Location		Siting Rationale	Sampling Frequency
SWS-1	San Antonio Creek Midpoint	Endangered Species	Q
SWS-2	San Antonio Creek Exit	Endangered Species	Q
SWS-3	Shuman Creek	Casmalia Drainage	Q
SWS-4	Santa Ynez River	Base Drainage	Q
SWS-5	San Miguelito Creek	Background STS	S
SWS-6	Salsipuedes Creek	Background STS	S
SWS-7	Jalama Creek	Background STS	S
SWS-8	Canada del Jolloru	Background STS	S
SWS-9	Water Canyon	Background STS	S
SWS-10	Canada Aqua Viva	Background STS	S
SWS-11	Oil Well Canyon	Background STS	Q
SWS-12	Unnamed Creek	Background STS	Q
SWS-13	Red Roof Canyon	Background STS	Q
SWS-14	Canada Honda Creek	Background STS	S
SWS-15	Bear Creek	Downgradient SLC-3	Q
SWS-16	Oak Canyon	Downgradient Landfill	M
SWS-17	Spring Canyon	Downgradient SLC-4	S

Key:

Q = Quarterly.
S = Semiannually.
M = Monthly.
STS = Space Transportation System.
SLC = Space Launch Complex.

Source: USAF Hospital, 1984.

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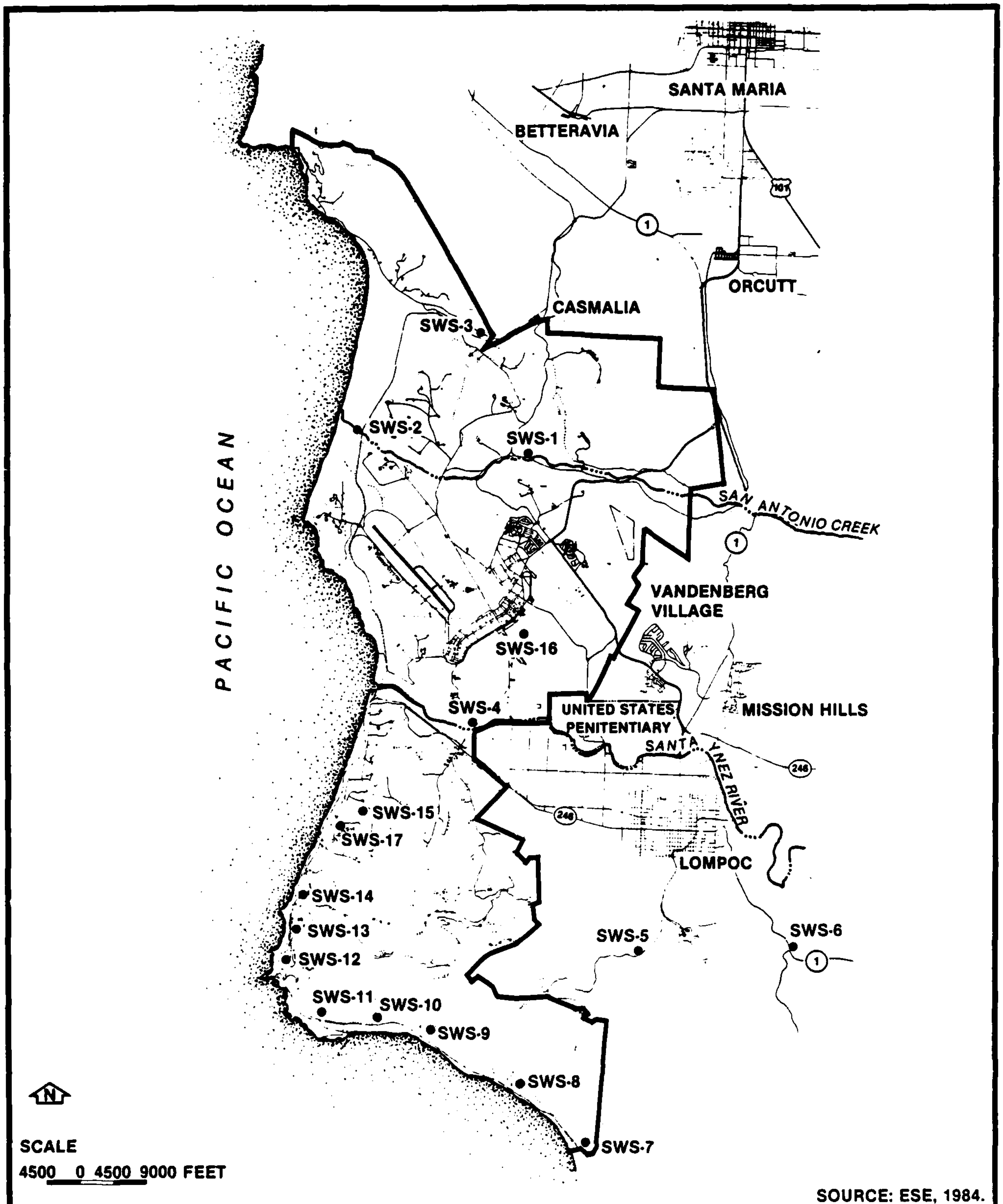

Figure 3.4-1
LOCATIONS OF SURFACE WATER MONITORING STATIONS IN VAFB ENVIRONMENTAL MONITORING PROGRAM

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Vandenberg Air Force Base

Table 3.3-2. Construction Details for VAFB Water Supply Wells

Well No.	State of California Well No.	Year of Construction	Casing Depth (ft)	Highest Screened Interval (ft)	Capacity (gpm)
South Vandenberg 1	7N/35W-33J02	1960	465	170	500
South Vandenberg 3	7N/35W-33J03	1969	472	370	400
Santa Ynez 3	7N/34W-19J01	1982	250	80	2,200
Santa Ynez 4	7N/34W-20M02	1971	192	77	820
Santa Ynez 5	7N/34W-20K06	1981	177	97	1,265
Santa Ynez 6	7N/34W-20L02	1983	340	100	1,950
San Antonio 4	7N/34W-16C05	1973	342	160	940
San Antonio 5	8N/34W-16J02	1975	400	160	900
San Antonio 6	8N/34W-16G04	1975	408	220	1,100
San Antonio 7	8N/34W-16F02	1975	408	210	970

Source: USAF Hospital, 1982.

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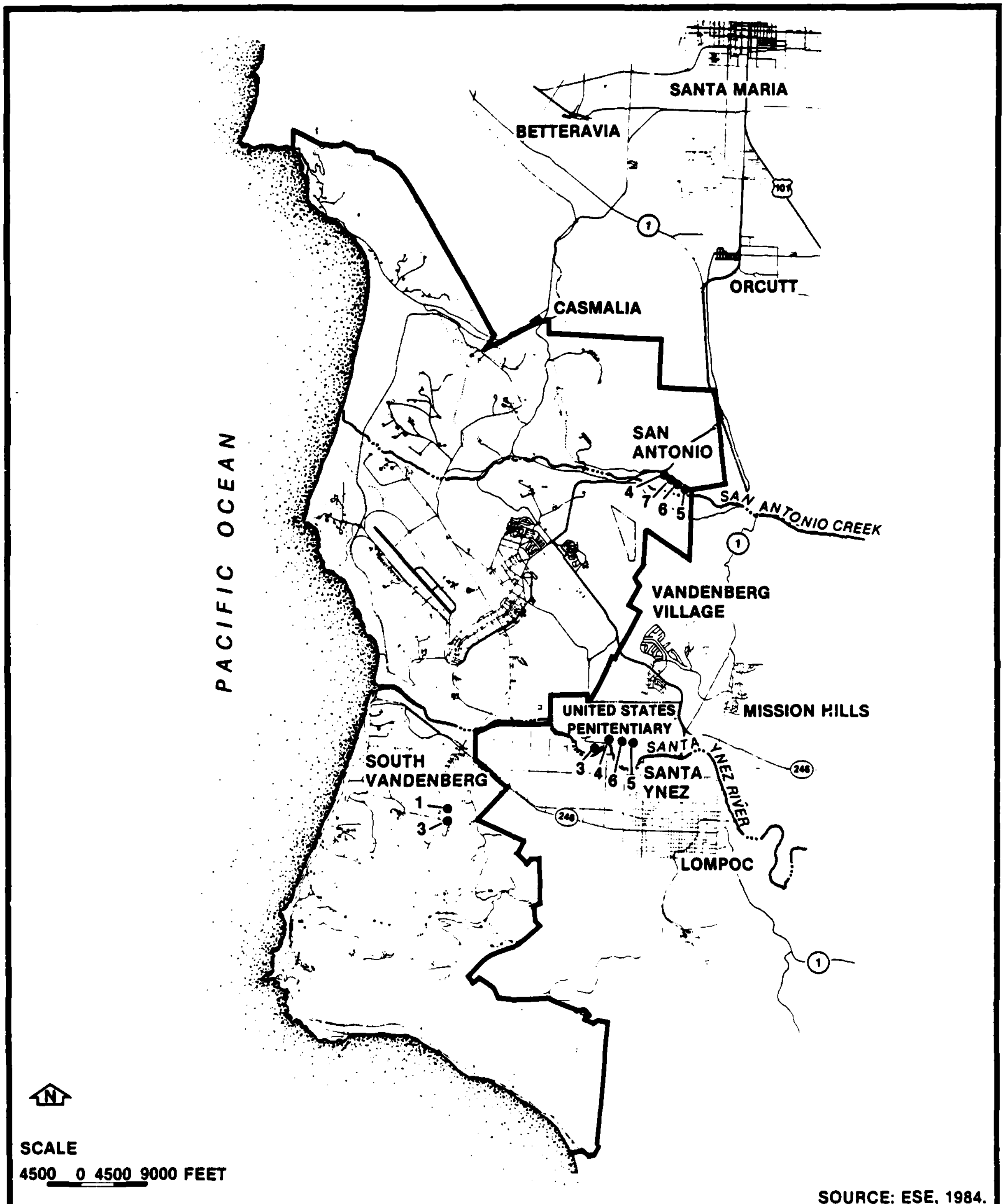


Figure 3.3-8 POTABLE WELL LOCATIONS	INSTALLATION RESTORATION PROGRAM Vandenberg Air Force Base

Potable water for VAFB is supplied by the San Antonio, Santa Ynez, and Lompoc Terrace Aquifers. Production zones for the San Antonio and Santa Ynez Aquifers are the Alluvium, Orcutt Sand, Paso Robles, and Careaga Formations. Recharge to the San Antonio Aquifer occurs through infiltration of precipitation and seepage from streams. The Santa Ynez Aquifer is recharged by direct infiltration into Lompoc plain and by ground water flow from upper portions of the Santa Ynez watershed.

Consolidated Aquifer System

The consolidated aquifer system consists of Tertiary age mudstone, shales, and sandstone of marine origin. The Foxen, Sisquoc, Monterey, Rincon, Vaqueros, Sespe, and Tejon formations are usually not water bearing, except for localized lenses of porous sand and fractures. The South VAFB well field draws from porous units of the consolidated aquifer system. Rechange to this aquifer occurs through downward leakage and direct infiltration in the outcrop areas.

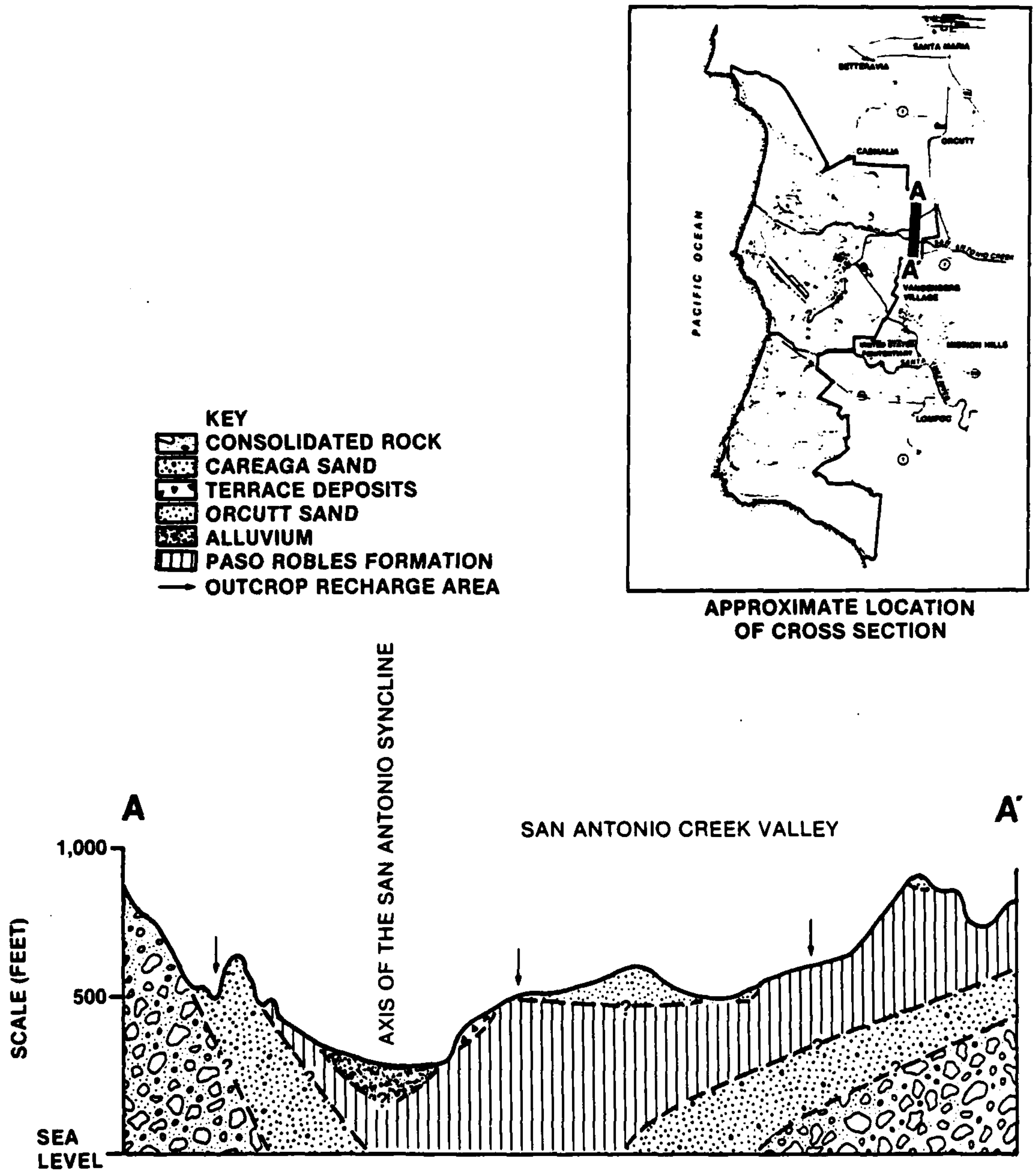
Installation Water Wells

Potable water on VAFB is supplied by 10 onbase wells. The wells are divided into three well fields: South Vandenberg, Santa Ynez, and San Antonio. Locations of the potable wells are shown in Fig 3.3-8. Each well field draws water from separate localized aquifer systems (see Fig. 3.3-5). Construction details for VAFB water supply wells are shown in Table 3.3-2.

3.4 WATER QUALITY

3.4.1 SURFACE WATER QUALITY

The VAFB Environmental Monitoring Program includes routine water quality monitoring at 17 locations (see Fig. 3.4-1). The sampling locations, siting rationale, and sampling frequency for the monitoring stations are provided in Table 3.4-1. Data for 1983 are presented for each of these stations in Table 3.4-2. The majority of surface water monitoring stations (SWS-5 through SWS-14) are used to monitor ambient water quality in the vicinity of the Space Shuttle launch complex. Surface water monitoring stations at Bear Creek (SWS-15), Oak Canyon (SWS-16), and Spring Canyon (SWS-17) represent downgradient monitoring of industrial areas. The remaining monitoring stations (SWS-1 through SWS-3) involve critical environments relating to endangered species present on North VAFB.



SOURCE: MUIR, 1964.

Figure 3.3-7
CROSS SECTION THROUGH SAN ANTONIO CREEK VALLEY

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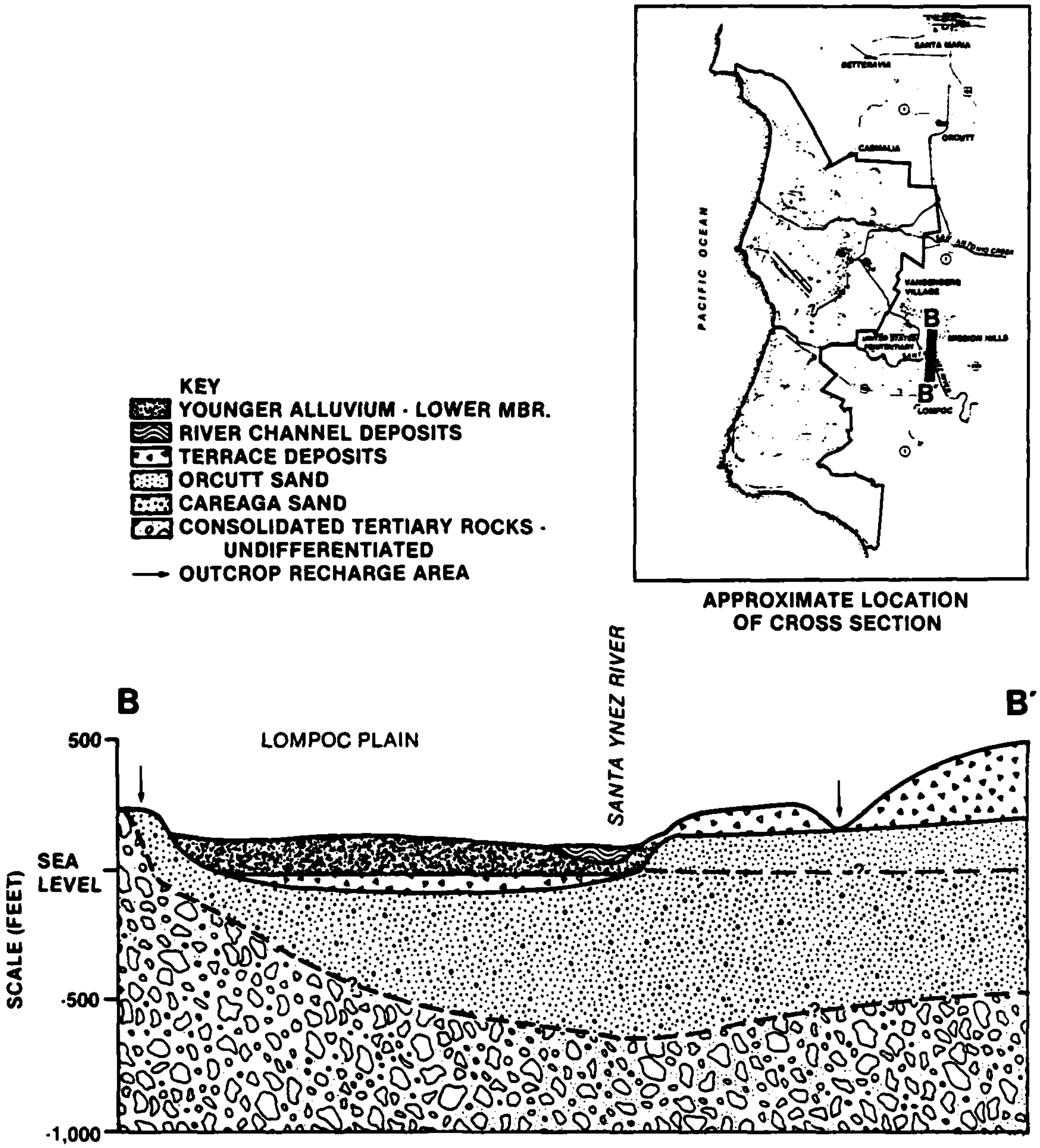

SOURCE: MUIR, 1964.

Figure 3.3-6
CROSS SECTION THROUGH LOMPOC VALLEY

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Unconsolidated Aquifer System

The unconsolidated deposits on VAFB range from 500 to 1,000 ft in thickness and overlie consolidated rock. The Careaga sand is a fine- to medium-grained, massive, marine sand with minor amounts of gravel and limestone. Recharge to this formation occurs through infiltration of precipitation in the outcrop areas. The main water-bearing unit occurs in the Lompoc area (see Figs. 3.3-5 and 3.3-6).

The Paso Robles Formation is composed of terrigenous deposits of clay, silt, sand, and gravel. The formation underlies most of the San Antonio Creek valley (see Fig. 3.3-7) and the upper sections of the Santa Ynez valley. The sand and gravel sections of the unit yield moderate to high amounts of water [approximately 1,000 gallons per minute (gpm)] in the Santa Ynez upland areas and the San Antonio Creek areas. Recharge to this formation occurs primarily from downward leakage of overlying water bearing units.

The Orcutt Formation consists of unconsolidated sand, gravel, and clay of both marine and nonmarine origin. The unit consists of uncontinuous lenses of sand that hold relatively large amounts of water but cannot transmit or yield large amounts of water to wells. The upland terrace deposits are generally above the zone of saturation and allow percolation of rainwater to the underlying permeable deposits. The terrace deposits consist of lenses of sand, gravel, and fine-grained material. Localized accumulation of water does occur in perched water tables; however, well yields are low to moderate (approximately 100 to 400 gpm). Alluvial deposits on the valley floor form the main unconsolidated aquifer in the San Antonio Creek and Santa Ynez River areas. The alluvium consists of gravel, sand, silt, and clay of fluvial origin. The alluvial deposits can be divided into two members--upper and lower. The lower member rests unconformably upon the terrace deposits and consists of mainly gravel and coarse sand. In the Lompoc area, the lower member has an average thickness of 110 ft. The upper member of the alluvium shows a much finer grained sequence consisting of silts and clays. The lower member is the principal source of water for VAFB and the Lompoc area (Upson and Thomasson, 1951).

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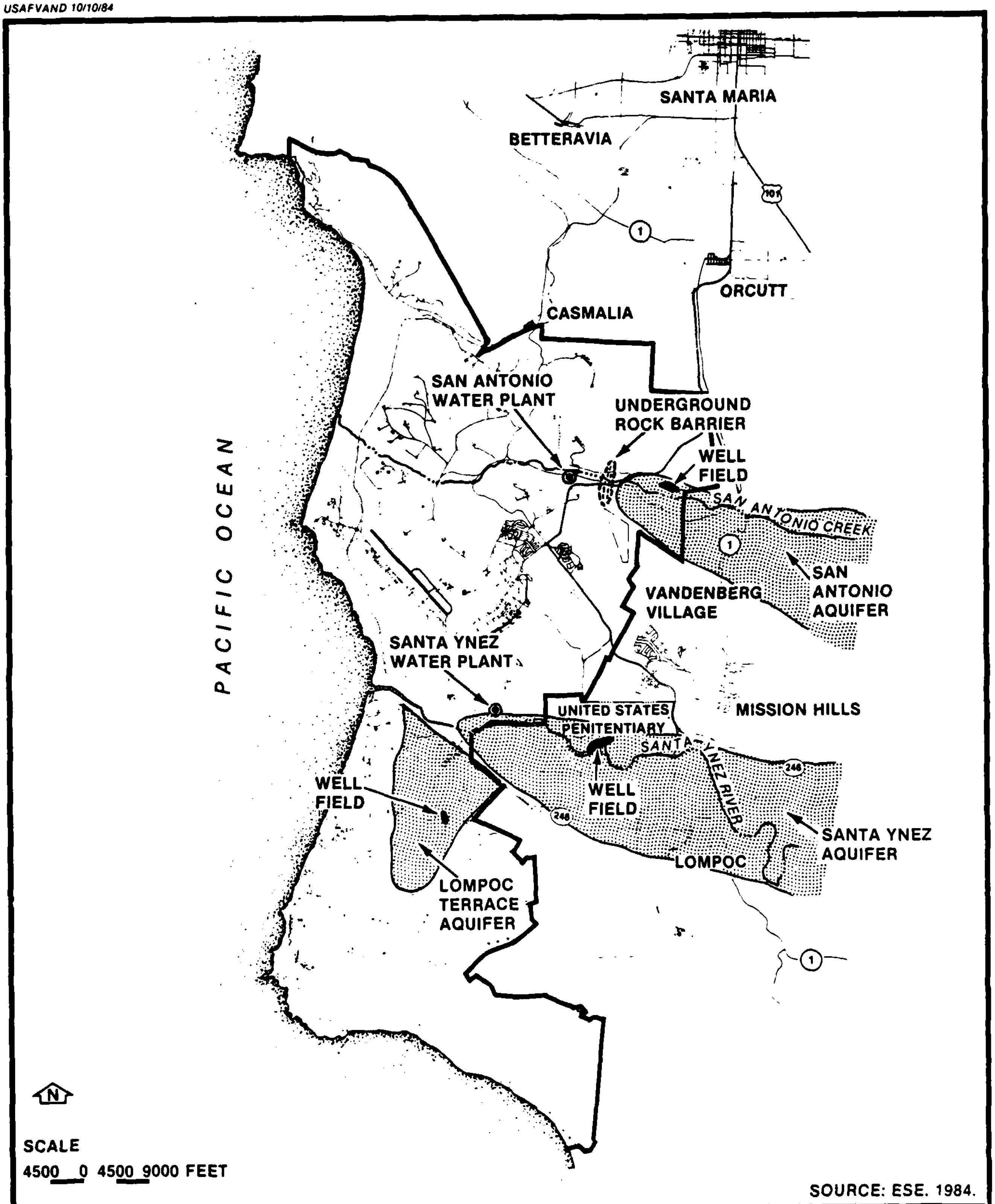

Figure 3.3-5
LOCATIONS OF POTABLE AQUIFERS UNDERLYING VAFB

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Table 3.4-3. Monitor Well Locations, Siting Rationale, and Sampling Frequency

Well Location		Siting Rationale	Sampling Frequency
W-10	Santa Ynez Water Treatment Plant	Downgradient of sludge stockpile	Not currently sampled
W-11	Landfill No. 2	Upgradient of landfill	Quarterly
W-12	Landfill No. 2	Downgradient of landfill	Quarterly
W-13	Oak Canyon	Downgradient of landfill	Quarterly
W-14	Oak Canyon	Downgradient of landfill	Quarterly
W-22	Landfill No. 2	Upgradient of landfill	Quarterly
W-23	Landfill No. 2	Upgradient of landfill	Quarterly
W-25	Agena Tank Farm	Upgradient of disposal area	Quarterly
W-26	Agena Tank Farm	Downgradient of disposal area	Quarterly
W-27	SLC-3	Upgradient of disposal area	Quarterly
W-28	SLC-3	Upgradient of disposal area	Quarterly
W-29	Washington Ave.	Former Camp Cooke washrack	Quarterly
32N1	Bear Creek Rd.	Downgradient SLC-3	Quarterly
361K1	Coast Rd.	Downgradient SLC-4	Quarterly
361J1	Surf Rd.	Downgradient SLC-4	Quarterly

Source: BES, 1984.

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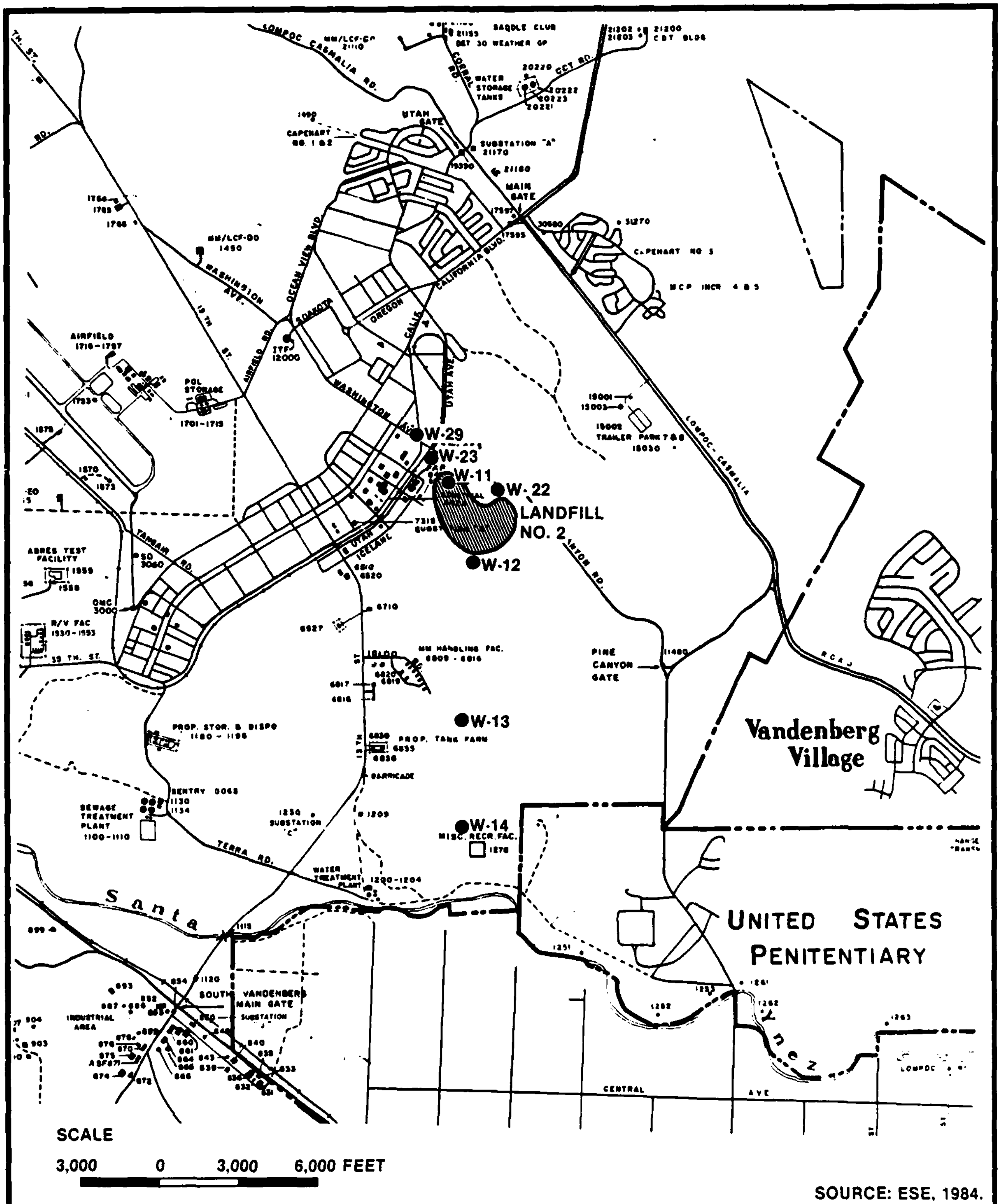

Figure 3.4-3
MONITOR WELL LOCATIONS IN THE VICINITY OF THE EXISTING SANITARY LANDFILL

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Table 3.4-4. Contaminants Found in Monitor Wells on VAFB

Monitor Well	Contaminants
W-11	Trichloroethylene
	Ethyl benzene
	1,2-dichlorobenzene
	1,2-dimethylbenzene
	1,4-dimethylbenzene
	Methylene chloride
W-23	Trichloroethylene
	Tetrachloroethylene
	Methylene chloride
	Chloroform
	Toluene
	trans-1,2-dichloroethene

Note: Chemical concentrations and sampling dates are available from BES.

Source: BES, 1984.

Samples from Well 12 (W-12) located immediately downgradient of the fill area, show cadmium, iron, and high levels of dissolved solids, manganese, and chlorine. Well 12 also is considered contaminated by landfill leachate. The leachate retention pond (see Sec. 4.2) adjacent to Well 12 also shows high organic carbon levels and the presence of several volatile organics.

Farther downgradient, Well 13 (W-13) is located between the sanitary landfill and the Santa Ynez River. Well 13 has a depth of 39 ft and does not penetrate water-bearing units. Samples from Well 14 (W-14), located 2.2 miles downgradient near the Santa Ynez River, indicate no volatile organic compounds and slightly elevated total dissolved solids and manganese values.

Monitor well construction details and available lithologic logs are presented in App. K.

3.5 BIOTIC COMMUNITIES

VAFB is situated in south-central California, adjoins the Pacific Ocean for a distance of about 35 miles, and covers an isolated coastal area containing approximately 98,400 acres. Much of VAFB was originally used for agricultural purposes, including cattle grazing, prior to purchase by the U.S. Army in 1941. Today VAFB comprises one of the last undeveloped open areas in coastal California.

The biota of VAFB is of special interest since the base occupies a section of California generally considered an ecological transition zone between northern and southern California. In response, a number of environmental assessments, ecological studies, and biological inventories have been conducted describing vegetation and wildlife resources on VAFB (4392nd AEROSG, 1977; AFSC, 1974; AFSC, 1976). The following summary of biological resources is based on this literature and an August 1984 site survey.

The terrestrial vegetation communities on VAFB include dune vegetation and coastal stand, chaparral, oak and pine woodlands, riparian forest, and tanbark oak associations. Additional, introduced shrub and tree species occur on improved grounds and the cantonment area. Aquatic systems on VAFB include a 35-mile-long shoreline along the Pacific Ocean and associated estuaries; marshes; several streams, including the Santa Ynez River, San Antonio Creek, and Honda Canyon Creek; and small lakes and ponds.

3.5.1 FLORA

The onbase distribution of terrestrial vegetation communities is determined by soil conditions, moisture conditions, previous land use, and past and current management practices. The composition and physiognomy of each community were classified, and the vegetation within each was quantitatively sampled, by the Center for Regional Environmental Studies, San Diego State University (AFSC, 1976).

Low, open dune vegetation and closed coastal sand cover the primary dunes and older, stabilized dunes, respectively, along the Pacific shoreline. Salt spray and wind erosion severely limit plant diversity in the primary dune zone. Coastal strand vegetation, occurring in the more protected secondary dune zone, includes sand verbenas (*Abronia* spp.), sea rocket (*Cakile maritima*), beach morning glory (*Conouloulus soldonella*), surf thistle (*Cirsium rhothophilum*), and franseria (*Franseria* spp.).

A coastal sage scrub occurs inland from the coastal strand on stabilized dunes. This community is characterized by larger shrubs and more herbaceous perennial species. Common species occurring in the coastal transitional sage scrub include bush lupine (*Lupinus chamissonis*), mustards (*Erysimum* spp.), fleabean (*Erigeron folliosus*), butterweed (*Senicio blochmanae*), paintbrush (*Castilleja* spp.), and mock heather (*Haploppapus ericoides*). The coastal sage scrub also occurs on VAFB on the sides of most of the larger canyons, along the top of Honda Ridge, and in various lower elevations on base. Dominant species of the

coastal scrub-normal phase include California sagebrush (Artemesia californica), black sage (Salvia mellifera), lompoc monkey flower (Displacus lompacensis), and broad-leaved buckwheat (Erioguum parvifolium). Purple sage (Salvia leucophylla) replaces black sage on dryer ridges, where it comprises more than 50 percent of the ground cover. California sagebrush and Encelia california comprise an additional 25 to 35 percent of the vegetation cover in the purple sage zone.

Chaparral on VAFB occurs predominantly on higher ridges and mesas. The major onbase chaparral areas include the Burton Mesa, the Santa Ynez Ridge on South VAFB, and parts of Honda Ridge. The common shrub species of the VAFB chaparral communities include several species of bearberries (Arctostaphylos spp.), several species of buckbrush (Ceanothus spp.), scrub oak (Quercus coislizenii), and chamise (Adenostoma fasciculatum). Huckleberry scrub (Vaccinium spp.) occurs in moister areas of chaparral.

With increased soil moisture, chaparral communities grade into Bishop pine forest (Pinus muricata) or tanbark oak forest (Lithocarpus densiflora). Bishop pine forest on VAFB occurs in small patches and stands on the Santa Ynez Ridge area, Plato Road Ridge, Honda Ridge Road, and in Lake Canyon. Bishop pine usually occurs with chaparral shrubs (e.g., Vaccinium ovatum, Ceanothus spp., Arctostaphylos spp.) and ferns (Polystichum munitum, Pteridium aquilinum). Bishop pines do not reach commercial size, and are not logged.

Tanbark oaks replace Bishop pines on the Tranquillon Mountain and Oak Mountain slopes in areas of higher moisture resulting from fog precipitation. On Tranquillon Mountain the major forest vegetation includes tanbark oak, huckleberry (Vaccinium ovatum), salal (Gaultheria stallon), and sword fern (Polystichum munitum). Additional chaparral species also occur in this habitat.

Oak woodland, consisting primarily of coast live oak (Quercus agrifolia), occurs in open stands and forests in the valleys and moister slopes of VAFB. Live oak-dominated woodlands cover approximately 4 percent of VAFB, but may have been much more widespread prior to agricultural clearing.

Riparian forest on VAFB occurs along the Santa Ynez River valley, along parts of the San Antonio Creek, and to a lesser degree, at the bottom of large canyons such as Honda, Shuman, and LaSalle. The dominant plant species in this community include willows (Salix lasiolepis, S. lasiandra), black cottonwood (Populus trichocarpa), and box elder (Acer negundo).

Open, nonforested communities on VAFB include coastal saltmarsh at the mouth of the Santa Ynez River, freshwater marsh along streams upstream from saltwater intrusion, and grasslands. Native and introduced plant species in these communities are discussed in the VAFB Ecological Assessment (AFSC, 1976). Vegetation maps showing the onbase distribution of major vegetation communities on the northern and southern portions of VAFB are shown in the VAFB Ecological Assessment (AFSC, 1976).

Several plant species listed as rare, unique, or endangered by the state of California and U.S. Fish and Wildlife Service (FWS) occur or are expected to occur on VAFB. The occurrence of each species in each of the vegetational units of VAFB is summarized in Table 3.5-1.

3.5.2 FAUNA

The diversity of onbase habitats, ranging from Pacific shoreline and marshes to scrub and forests, results in a diverse vertebrate fauna on VAFB. This fauna includes 55 species of mammals, numerous species of birds, 28 species of reptiles, and 13 species of amphibians expected to occur onbase. The distribution of these vertebrate species within VAFB habitats is discussed and tabulated in the VAFB Ecological Assessment

Table 3.5-1. Status of Rare or Endangered Plants on VAFB, by Vegetational Association

Common Name	Bishop Pine Forest	Tanbark Oak Forest	Oak Woodland	Riparian Woodland	Chaparral	Coastal Sage Scrub (Normal)	Coastal Sage Scrub (Purple Sage)	Coastal Sage Scrub (Stabilized Dune)	Coastal Strand	Coastal Salt Marsh	Freshwater Marsh	Annual Grassland
Gracious Thistle				E								
Surf Thistle									O			
Branching Beach Aster	O											
Ida Mae's Daisy								O				
Santa Ynez False Lupine		E										
Cream Dilentra					O							
Lompoc Yerba Santa	O				O							
Crisp Monardella								O				
Club-haired *Mariposa*												E
Hoover's Bent Grass					E							
Narrow-leaved Spine Flower					E			E				
Brewer's Spine Flower												E
Nipomo Ceanothus					E							
Soft-leaved Indian Paint-brush								O	O			
Black-flowered Figwort			O	O	O			O				
Arguello Wallflower								O				
Lompoc Wallflower						O		O				
Shagbark Manzinita					O							
Lompoc Manzinita					O							
Blochman's Butterweed								O				
<u>Chorizanthe</u> <u>diffusa</u>*					O							
<u>Chorizanthe</u> <u>rectispina</u>*												E
Saltmarsh Bird's-beak										E		
<u>Erigonum</u> <u>gracile</u> var. <u>cithariforme</u>*			E									
Green Beach Primrose									O			
Surf Malacothrix									O			
Number of Species	2	1	2	2	9	1	0	8	4	1	0	3

* No common names available.

Key: E = Expected association from literature review.
O = Observed association on VAFB.

Source: Powell, 1974.

(AFSC, 1976), Environmental Narrative (4392nd AEROSG, 1977), and several environmental assessments (e.g., WESTEC Services, Inc., 1982).

The freshwater fish fauna of VAFB includes 12 species and, as for most of California, consists primarily of introduced species. These species and their onbase distribution are shown in Table 3.5-2.

Aquafauna

A number of fish and wildlife species residing on VAFB are listed as rare, threatened, or endangered by the state of California and FWS. The three-spined stickleback (*Gasterosterus aculeatus*) is the only native species of freshwater fish on VAFB. This species is represented by two subspecies onbase, the partially armored three-spined stickleback (*G. a. microcephalus*) and the unarmored three-spined stickleback (*G. a. williamsoni*). The partially armored stickleback occurs over much of California and occurs in several streams on VAFB. In contrast, the distribution of the unarmored stickleback is generally limited to the Los Angeles Basin. On VAFB, the latter occurs in San Antonio Creek and, formerly, in El Rancho Pond. The unarmored stickleback is listed as endangered by FWS and the state of California. Both agencies are assisting VAFB in introducing this endangered species in other onbase streams as part of a recovery program.

Herpetologic Animals

Five amphibians and six reptiles occurring or expected to occur on VAFB are regulated by the state of California. Of these, the southwestern toad (*Bufo microscaphus*) and red-legged frog (*Rana aurora*) are protected by the state of California. Both species are restricted to riparian woodlands and freshwater marshes of VAFB. The Pacific leatherback turtle (*Dermochelys coricea*), listed as endangered by FWS and California, is a marine reptile occurring occasionally along the VAFB shoreline.

Table 3.5-2. Aquatic Vertebrates Found on VAFB

Scientific Name	Common Name	Location*
Cyprinus carpio	Carp	SA
Gambusia affinis	Mosquito fish	SYR,SA,ER,LC,CL,MOD III,PB
Gasterosteus aculeatus microcephalus	Partially armored three-spined stickleback	SYR
Gasterosteus aculeatus williamsoni	Unarmored three-spined stickleback	SA,ER
Ictalurus catus	White catfish	SA
Ictalurus punctatus	Channel catfish	CL,MOD III,PB
Lepomis macrochirus	Bluegill sunfish	MOD III,SYL
Lepomis microlophus	Red-ear sunfish	PB
Micropterus salmoides	Largemouth bass	CL,MOD III,PB,LC
Pimephales promelas	Fathead minnow	SYR
Pomoxie nigromaculatus	Black crappie	LCL
Salmo gairdneri	Rainbow trout	MOD III

* SA = San Antonio Creek
SYR = Santa Ynez River
ER = El Rancho Road
LC = Lompoc Casmalia Pond
LCL = Lower Canyon Lake
MOD III = Mod III Lake
PB = Punchbowl Lake
CL = Canyon Lake

Source: AFSC, 1976.

Avifauna

Eight species of birds, occurring or potentially occurring on VAFB, are listed as endangered, threatened, or rare by FWS and/or the state of California. The American peregrine falcon (*Falco peregrinus anatum*), California brown pelican (*Pelecanus occidentalis californicus*), California least tern (*Sterna albifrons browni*), light-footed clapper rail (*Rallus longirostris levipes*), and southern bald eagle (*Haliaeetus l. leucocephalus*) are listed as endangered by FWS and California. Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and white-tailed kite (*Elanus leucurus*) are protected by the California Fish and Game Department only.

With the exception of whales, no mammals occurring on VAFB are listed as threatened or endangered.

3.6 ENVIRONMENTAL SETTING SUMMARY

The main cantonment area of VAFB is located on Burton Mesa, a low-lying plateau on the south-central California coast. Elevations at VAFB vary from 0 ft msl along the Pacific Ocean to 1,500 ft msl in the Purisima Hills north of the cantonment area and 2,150 ft msl in the Santa Ynez Mountains to the south. The major drainage features on VAFB are San Antonio Creek, located north of the cantonment area, and the Santa Ynez River, which separates North and South VAFB. Other streams in VAFB include Shuman Creek, Canada Honda Creek, Bear Creek, Canada Tortuga Creek, and Jalama Creek.

Soils on VAFB consist of sands, silts, clay, clay loams, and shale. These soils are considered permeable and would be susceptible to infiltration by contaminants.

Three major aquifers are found under sections of VAFB. These include the Santa Ynez, Lompoc Terrace, and San Antonio Aquifers. The Santa Ynez and San Antonio Aquifers are located in the unconsolidated alluvial

and fluvial sand and gravel deposits which occur at depths up to 1,000 ft under VAFB. The Lompoc Terrace Aquifer underlying South VAFB is located in both consolidated and unconsolidated deposits. Recharge to these aquifers occurs primarily from downward leakage of overlying water-bearing units.

Average annual rainfall at VAFB is 15.5 inches, 84.5 percent of which occurs from November through April. The mean annual lake evaporation rate at VAFB is 44 inches. Therefore, the net annual precipitation rate for VAFB (rainfall minus evaporation) is -28.5 inches. The 1-year, 24-hour rainfall event is 3.0 inches in December. Average monthly temperatures range from 69°F in October to 60°F in March. As a result of its coastal location, temperatures are moderated and remain fairly constant throughout the year.

Several threatened and endangered species are known to occur on VAFB and in the area, including the unarmored three-spined stickleback, peregrine falcon, Bell's vireo, and California least tern. The stickleback is known to exist only in San Antonio Creek on VAFB. VAFB personnel, with cooperation from state and Federal wildlife agencies, are attempting to establish other breeding populations on the installation in both Shuman and Canada Honda Creeks.

As a result of the geohydrological environment and soil characteristics, conditions on VAFB are conducive to contaminant migration. Potential contaminant migration from the cantonment area could occur laterally through the alluvium deposits in the canyons that open toward Santa Ynez River. Any migration of contaminants into this area could potentially contaminate the Santa Ynez Aquifer, which is used as a potable water source by the town of Lompoc and by VAFB.

4.0 FINDINGS

To assess hazardous waste management at VAFB, past activities of waste generation and disposal methods were reviewed. This section contains a summary of hazardous wastes generated, a description of waste disposal methods, an identification of the disposal sites onbase, and an evaluation of the potential for environmental contamination.

4.1 CURRENT AND PAST ACTIVITY REVIEW

To identify past activities that resulted in generation and disposal of hazardous waste, current and past waste generation and disposal methods were reviewed. This activity consisted of a review of files and records, interviews with current and former base employees, and site inspections.

VAFB operations described in this section are those which handle, store, or dispose of potentially toxic or hazardous materials. These operations include industrial and laboratory operations and activities in which pesticides; polychlorinated biphenyls (PCB); petroleum, oils, and lubricants (POL) (including organic solvents); radiological materials; and explosives are handled. No large-scale product-manufacturing operations have been conducted at VAFB. Rather, the industrial operations described in this section are primarily maintenance-support functions provided for facilities, aircraft, space vehicles, and ground vehicles.

Since the initiation of industrial activity in 1942, at what was then Camp Cooke, various disposal practices for wastes (both onsite and offsite) have been used. In general, past waste disposal methods conformed to standard practices for that time period. With the promulgation of Federal regulations in the late 1970s controlling toxic and hazardous materials, many former disposal practices changed, and the regulated wastes have since been disposed of offsite by hazardous waste contractors.

Industrial activity from Camp Cooke and early VAFB days has cycled from nearly no activity to several times the amount of today's activity. Often, specific information concerning waste generation rates and waste types of the early industrial activity was not available during the onsite survey. Industrial operations performed by the Army during the Camp Cooke era and by the Navy during the Point Arguello period included many activities currently performed by the Air Force (e.g., vehicle maintenance, painting, printing, and other base support activities). The activities generated many of the same types of wastes as current Air Force operations. Therefore, unless otherwise stated, current waste types, generation rates, and shop locations are assumed to be representative of historical Air Force activity. App. E contains a list of shops currently operating on VAFB. Past and current shops, activities, and waste treatment, storage, and disposal practices are discussed in this section.

A summary of waste generation from VAFB industrial operations is presented in Table 4.1-1. Industrial shops, activities, and waste treatment, storage, and disposal are described in the following paragraphs.

4.1.1 INDUSTRIAL OPERATIONS

4.1.1.1 1ST STRATEGIC AEROSPACE DIVISION

394TH ICBM TEST MAINTENANCE SQUADRON

Field Maintenance Team

The Field Maintenance Team (Bldg. 6601) is responsible for routine maintenance in support of operations of the 394th ICBMTMS. Wastes generated during normal maintenance include lube oil [60 gallons per year (gal/yr)], ethylene glycol (100 gal/yr), and Freon® [700 pounds per year (lb/yr)]. Since operational startup in 1960, waste lube oil has been disposed of through contracts with local waste oil dealers. (Waste disposal, hazardous or otherwise, that is handled by contract will be referred to as "contract disposal" throughout this report.) Diluted ethylene glycol (engine coolant) has typically been discharged to grade at the job site; Freon® has been evaporated directly into the atmosphere.

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 14 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
F. SECURITY POLICE SQUADRON--Vehicle Maintenance Shop	13600	Lube oil	500	Contract disposal (c. 1975 →)
		Brake shoes	Variable	Returned to manufacturer (c. 1975 →)
		Oil filters	Variable	VAFB landfill (c. 1975 →)
G. TRANSPORTATION SQUADRON				
1. Body Shop	10726B	Paint slops	420	Camp Cooke landfill (1945–1960); VAFB landfill (1960 →)
		Lacquer thinner	600	Onsite evaporation (1945–1965); Contract disposal (1965 →)
		Empty paint cans	25 drums/yr	Camp Cooke landfill (1945–1960); VAFB landfill (1960 →)
2. Base Maintenance and Equipment Shop	10713	Stoddard solvent (PD-680)	300	Contract disposal (1970 →)
		Solvents (various types)	300	Camp Cooke landfill (1945–1960); BFT (1960–1965); Contract disposal (1965–1970)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 13 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980 / 1984)
7. Fire Protection Branch--Fire Extinguisher Maintenance Shop	9351	Lube oil	40	Camp Cooke landfill; BFT; Contract disposal
		Dry chemical (bromochlorotrifluoromethane)	8,000 lb/yr	Landfill, firefighter training, or firefighting
E. MORALE, WELFARE, AND RECREATION DIVISION--Auto Hobby Shop	6437	Lube oil	3,000	Contract disposal
		Grease	60	Contract disposal
		Ethylene glycol	55†	Discharged to storm sewer
		Sodium hydroxide	600 lb/yr†	Contract disposal
		Paint-booth filters	Variable	VAFB landfill
		Stoddard solvent	55	Contract disposal
		Cold parts cleaner (type unknown)	15	Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 12 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
6. Sanitation Section				
a. Water Treatment Plants	1200 (Santa Ynez)	Sludge (soda ash, lime, and sulfuric acid in sludge)	1.2 M lb/yr	Dried in drying beds and stockpiled →
		Sulfuric acid	80 lb/mo	Diluted and discharged to evaporation/percolation pond →
		Caustic soda	50 lb/mo	Diluted and discharged to evaporation/percolation pond →
	22310 (San Antonio)	Brackish backwash water	Unknown	Landspread adjacent to treatment plant
b. Wastewater Treatment Plant	1100-1110	Treated effluent	Design capacity 3.1 MGD	Discharged to Pacific Ocean; Discharged to retention ponds
		Sludge	Variable	Dried in drying bed and contract disposed

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 11 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
5. Electrical Section--Exterior Electric Shop (Continued)		Transformer oil filters	Variable	Camp Cooke landfill (to ~1960); VAFB landfill (~1960 to ~1977); Contract disposal (~1977 →)
		Transformer carcasses	Variable	Contract disposal →
		Light-fixture ballasts (possible PCB contamination)	Variable	Camp Cooke landfill (to ~1960); VAFB landfill (~1960 to ~1977); Contract disposal (~1977 →)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 10 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
c. Heating Shop (Continued)		Resin regeneration salt and chemicals	25,600 lb/yr†	*Discharged to sanitary sewer* →
		Boiler-cleaning chemicals	16,900†	Neutralized and discharged to sanitary sewer →
5. Electrical Section--Exterior Electric Shop	11434	Transformer oil (mineral oil)	300	Camp Cooke landfill | BFT | Contract disposal
		Non-PCB transformer oil	200	Contract disposal →
		PCB transformer oil	100	Contract disposal →

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 9 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
b. Liquid Fuels Maintenance Shop	11352 11439 (1960-1971)	Lube oil	55	Camp Cooke landfill → BFT → Contract disposal
		Contaminated fuels	300	Camp Cooke landfill → BFT → Contract disposal
		Tetrachloroethylene	55	Camp Cooke landfill → Contract disposal
		Tricresylphosphate	55	Camp Cooke landfill → Contract disposal
		Fuel sludges	Variable	Camp Cooke landfill → VAFB landfill → Contract disposal
c. Heating Shop	11352	Boiler blowdown	850†	Discharged to sanitary sewer

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 8 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
4. Mechanical Section				
a. Refrigeration/Air Conditioning Shop	11352	Ethylene glycol	1,200†	Disposed of in sanitary sewer
		Freon® 111, 113	500	Camp Cooke landfill → VAFB landfill → Contract disposal
		Lube oil	1,200	Camp Cooke landfill → BFT → Contract disposal
		Freon® 11, 12, 22	1,500 lb/yr	Vented to atmosphere

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 7 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
3. Structures Section				
a. Protective Coatings Shop	11439	Paint slops, latex	75	VAFB landfill (c. 1975–1984 →)
		Paint slops, oil base	1,000	Camp Cooke landfill (c. 1947–1960); Job site ground disposal (1960–c. 1975)
			10	Contract disposal (c. 1975 →)
		Thinner	500	Camp Cooke landfill (c. 1947–1960); Job site ground disposal (1960–c. 1975); Contract disposal (c. 1975 →)
		Paint remover	240	Job site ground disposal (c. 1947 →)
		Rags	Variable	Camp Cooke landfill (c. 1947–1960); VAFB landfill (1960 →)
		Sand-blasting residue	79,000 lb/yr	Camp Cooke landfill or used as sandbag material (c. 1947–1960); Used as sandbag material (1960 →)
b. Masonry Shop	7303	Muriatic acid	25†	Discharged to storm drain (c. 1947 →)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 6 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
2. Pavement and Grounds Section				
a. Heavy Equipment Maintenance Shop	10715	Hydraulic fluid	100	Camp Cooke landfill → BFT → Contract disposal
		Lube oil	200	Camp Cooke landfill → BFT → Contract disposal
		Aircraft-cleaning compound	55†	Discharged to storm drain
b. Pavements Shop	10715 717 720	Diesel fuel	150	Evaporated on ground at job site
		Kerosene	200	Evaporated on ground at job site
		Aircraft-cleaning compound	55†	Discharged to storm drain
		Lube oil	250	Camp Cooke landfill → BFT → Contract disposal
		Hydraulic fluid	100	Camp Cooke landfill → BFT → Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 5 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
D. CIVIL ENGINEERING SQUADRON				
1. Power Production Section				
a. Field Power Shop	11439	Lube oil	2,000	Camp Cooke landfill (to ~1960); BFT (~1960–1965); Contract disposal (~1965–1984)
		Ethylene glycol	500†	Discharged to grade at job site
		Degreasing solvent	110	Camp Cooke landfill (to ~1960); BFT (~1960–1965); Contract disposal (~1965–1984)
b. Manned Power Shop	64, 487, 185, 535, 676, 1280, 1783, 1856	Lube oil	3,000	BFT (~1960–1965); Contract disposal (~1965–1984)
		Aircraft-cleaning compound	300†	Discharged to storm drain (~1960–1984)
		Paint remover	700†	Discharged to storm drain (~1960–1984)
		Floor-cleaning compound	700†	Discharged to storm drain (~1960–1984)
		Calcium hypochlorite	1,000 lb/yr†	Discharged to storm drain (~1960–1984)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 4 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980 / 1984)
C. SUPPLY SQUADRON				
1. Agena Tank Farm	1180-1196	IRFNA	35	Neutralized and discharged to grade
		IRFNA-contaminated neutralization water	44,000†	Discharged to grade
		UDMH	<5	Neutralized and discharged to grade; CD
		UDMH-contaminated neutralization water	10,000†	Discharged to grade
		MMH	<5	Neutralized and discharged to grade; CD
		Fuel	80	Neutralized and discharged to grade
		Fuel-contaminated neutralization water	52,000	Discharged to grade
2. Titan Tank Farm	6830-6836	Nitrogen tetroxide (N_2O_4)	<5	Burned in propane-fired burner
		Neutralization water contaminated with N_2O_4	1,000	Discharged to grade; CD
		Aerozine 50	<5	Neutralized and discharged to grade; CD
		Neutralization water contaminated with Aerozine 50	25,500†	Discharged to grade; CD

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 3 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices 1950 – 1960	Waste Management Practices 1960 – 1970 – 1980 – 1984
B. SERVICES DIVISION					
1. Cafeterias	10343B	Refuse and food waste	3,285 yd^3/yr	Camp Cooke landfill	VAFB landfill
2. Service Station	10600	Lube oil	3,000		Contract disposal
		Texaco parts washer solvent #365	60		Contract disposal
		Batteries	420/yr		Returned to manufacturer
		Brake shoes	Variable		Returned to manufacturer
		Ethylene glycol	Variable†		*Discharged to storm drain*
		Oil filters and fuel filters	Variable		VAFB landfill
		Rags	Variable		Laundry service

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 2 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
5. <u>Electromechanical Shop</u>	6601	Sodium chromate	60†	VAFB landfill; Contract disposal
6. <u>Missile Handling Team</u>	8337	Paint stripper	5	VAFB landfill
		Hydraulic fluid	25	Contract disposal
7. <u>Refurbishing/Corrosion Control Shop</u>	1930	Waste paint	100	VAFB landfill; Contract disposal
		Paint thinner	100	Onsite evaporation; Contract disposal
II. <u>4392nd AEROSPACE SUPPORT GROUP</u>				
A. ADMINISTRATION DIVISION				
1. <u>Printing Plant</u>	7425	Silver solution	12†	Sent to 1369th AVS for silver recovery
		Film	Variable	Sent to 1369th AVS for silver recovery

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
I. 1ST STRATEGIC AEROSPACE DIVISION				
A. 394th ICBMTMS				
1. Field Maintenance Team	6601	Engine lube oil	60	Contract disposal
		Ethylene glycol	100†	Discharged to grade at job site
		Freon®	700	Onsite evaporation
2. Pneudraulic Shop	6601	Stoddard solvent	10	Onsite evaporation
		Solvents (various types)	10	Onsite evaporation
		Hydraulic fluid	360	Contract disposal
3. Mechanical Shop	6601	Lube oil	<50	Contract disposal
4. Power, Refrigeration, and Electrical Shop	6601	Sulfuric acid	60†	Neutralized and discharged to sanitary sewer
		Sodium chromate	100†	VAFB landfill; Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 15 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
2. Base Maintenance and Equipment Shop (Continued)		Hydraulic fluid	300	Camp Cooke landfill → BFT → Contract disposal
		Lube oil	840	Camp Cooke landfill → BFT → Contract disposal
		Aircraft-cleaning compound	420†	Discharged to storm drain
		Rags	Variable	Camp Cooke landfill → VAFB landfill
3. General Purpose Shop	10726A	TCE	660	Camp Cooke landfill → BFT → Contract disposal
		Stoddard solvent (PD-680)	1,320	Contract disposal
		Aromatic solvent (benzene based)	300	BFT → Contract disposal
		Hydraulic fluid	60	Camp Cooke landfill → BFT → Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 16 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
3. General Purpose Shop (Continued)		Solvent (90% diesel fuel)	1,320	Camp Cooke landfill; BFT; Contract disposal
		Ethylene glycol	1,320†	Discharged to storm drain; Contract disposal
		Sulfuric acid (37.5%)	240†	Neutralized and discharged to storm drain
		Brake pads	1,500	Camp Cooke landfill; VAFB landfill
		Brake shoes	Variable	Returned to manufacturer
4. *Minor Maintenance Shop*	*10706*	*Transmission* fluid	60	BFT; Contract disposal
		Brake fluid	12	BFT; Contract disposal
		Ethylene glycol	660†	Discharged to storm drain; Contract disposal
		Aromatic solvent (benzene based)	96	BFT; Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 17 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
5. Special Purpose Shop	10713	Transmission fluid	135	Camp Cooke landfill – BFT – Contract disposal →
		Hydraulic fluid	180	Camp Cooke landfill – BFT – Contract disposal →
		Stoddard solvent (PD-680)	600	Contract disposal →
		Solvent (type unknown)	600	Camp Cooke landfill – BFT – Contract disposal
		Ethylene glycol	600†	Discharged to storm drain – Contract disposal →
		Aircraft-cleaning compound	60†	Discharged to storm drain →
		Lube oil	9,000	Camp Cooke landfill – BFT – Contract disposal →
		Rags	Variable	Camp Cooke landfill – VAFB landfill →

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 18 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
6. Refueling Maintenance Shop	7501	Ethylene glycol	660†	Discharged to storm drain; Contract disposal
		Hydraulic fluid	500	Camp Cooke landfill; BFT; Contract disposal
		Lube oil	720	Camp Cooke landfill; BFT; Contract disposal
		Stoddard solvent (PD-680)	420	Contract disposal
		Solvents (various types)	420	Camp Cooke landfill; BFT; Contract disposal
		Aircraft-cleaning compound	300†	Discharged to storm drain
		Oil filters	25 drums/yr	Camp Cooke landfill; VAFB landfill; Contract disposal
		Rags	Variable	Camp Cooke landfill; VAFB landfill

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 19 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
7. Battery Shop	10726A	Battery acid	300†	Neutralized and discharged to sanitary sewer (1960 →)
		Battery carcasses	600/yr	Contract disposal (1960 →)
		Rags	Variable	VAFB landfill (1960 →)
H. CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON (1961-1975)				
1. Welding Shop	1728	Kerosene	30	BFT; Contract disposal
2. Pneudraulic Shop	1728	Hydraulic fluid	120	BFT; Contract disposal
3. Corrosion Control Shop	1728	MEK	240	BFT; Contract disposal
		Acetone	100	BFT; Contract disposal
		Toluene	240	BFT; Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 20 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
3. Corrosion Control Shop (Continued)		Lacquer thinner	180	BFT – Contract disposal
		Alodine rinse water	Variable	Discharged to sanitary sewer
		Paint stripper	25	Discharged to storm drain
		Stoddard solvent (PD-680)	25	CD
		Paint slops	100	VAFB landfill
4. Organizational Maintenance Shop	1735	Lube oil	1,200	BFT – Contract disposal
		Hydraulic fluid	180	BFT – Contract disposal
5. Machine and Structural Shop	1728	MEK	25	BFT – Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 21 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
6. Aero Repair Shop	1728	Paint stripper	110	Discharged to storm drain (c. 1960–c. 1975)
		Stoddard solvent (PD-680)	60	CD (1970–c. 1975)
III. TENANTS				
A. AIR FORCE LOGISTICS COMMAND SUPPORT GROUP, DET. 41				
1. Paint Shop	9327	Lacquer thinner	200	Contract disposal (c. 1969–1984 →)
		Cellulose nitrate	200	Contract disposal (c. 1969–1984 →)
		Synthetic thinner	50	Contract disposal (c. 1969–1984 →)
		Paint slops	50	Contract disposal (c. 1969–1984 →)
		Mineral spirits	50	Contract disposal (c. 1969–1984 →)
		Spray-booth filters	Variable	VAFB landfill (c. 1969–1984 →)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 22 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
2. Machine Shop	9320	Stoddard solvent (PD-680)	25	Contract disposal (1970 →)
		Hydraulic fluid	180	Contract disposal (1970 →)
		Lube oil	60	Contract disposal (1970 →)
3. Nondestructive Inspection Shop	1892	Silver solution	30†	Silver recovery (1970 →)
		Rags	Variable	VAFB landfill (1970 →)
B. 37th AEROSPACE RESCUE AND RECOVERY SQUADRON, DET. 8				
1. Helicopter Maintenance Shop	1735	Lube oil	360	Contract disposal (c. 1972 →)
		Stoddard solvent (PD-680)	100	Contract disposal (c. 1972 →)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 23 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
1. Helicopter Maintenance Shop (Continued)		Nickel-cadmium battery solution	<25	Neutralized and discharged to sanitary sewer →
		Battery carcasses	2/yr	Contract disposal →
		Paint slops	25	Contract disposal →
		Aircraft-cleaning compound	50†	Discharged to storm drain →
2. Aerospace Ground Equipment Shop	1735	Lube oil	50	Contract disposal →
		Stoddard solvent (PD-680)	25	Contract disposal →
		Hydraulic fluid	50	Contract disposal →
		Contaminated fuels	Variable	Contract disposal →

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--*Waste Generation* (Continued, Page 24 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980 1984)
2. Aerospace Ground Equipment Shop (Continued)		MEK	25	Contract disposal
		Battery acid	2†	Neutralized and discharged to sanitary sewer
		Battery carcasses	4/yr	Contract disposal
		Aircraft-cleaning compound	55†	Discharged to storm drain
C. GENERAL SERVICES ADMINISTRATION--Vehicle Maintenance Shop	875	Lube oil	2,000	Contract disposal
		Lacquer thinner	12	Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 25 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
C. GENERAL SERVICES ADMINISTRATION--Vehicle Maintenance Shop (Continued)		Stoddard solvent (PD-680)	360	Contract disposal (ca. 1975–1984, continuing)
		Batteries	250/yr	Contract disposal (ca. 1975–1984, continuing)
		Tires	2,000/yr	Contract disposal (ca. 1975–1984, continuing)
		Brake shoes	Variable	Returned to manufacturer (ca. 1975–1984, continuing)
		Paint-booth filters	Variable	VAFB landfill (ca. 1975–1984, continuing)
		Oil and fuel filters	Variable	VAFB landfill (ca. 1975–1984, continuing)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 26 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
D. CONTRACTORS				
1. Wiley Labs—Parts-Cleaning Shop (1961-1965)	3319	Acid cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
		Alkaline cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
2. Con Am Services				
a. Metal-Plating Shop (1969-1972)	8130	Plating solution and rinse water	250,000†	Neutralized and discharged to sanitary sewer
b. Parts-Cleaning Shop (1965-1972)	8130 (1966-1972)	Acid cleaning solution and rinse water	750,000†	Neutralized and discharged to sanitary sewer
	3319 (1965-1966)	Alkaline cleaning solution and rinse water	750,000†	Neutralized and discharged to sanitary sewer

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 27 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
3. Bendix Corp. (1972-1975)				
a. Metal-Plating Shop	8130	Plating solution	500†	Neutralized and discharged to sanitary sewer
		Plating rinse water	5,000†	Neutralized and discharged to sanitary sewer
b. Parts-Cleaning Shop	8130	Acid cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
		Alkaline cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
		Isopropyl alcohol	500	Neutralized and discharged to sanitary sewer
4. Bionetics (1975-present)				
a. Metal-Plating Shop	8130	Plating solution	<100	Contract disposal
		Plating rinse water	5,000†	Neutralized and discharged to sanitary sewer
		Plating sludge	2	Contract disposal

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 28 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 1984)
b. Parts-Cleaning Shop	8130	Acid cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
		Alkaline cleaning solution and rinse water	500,000†	Neutralized and discharged to sanitary sewer
		Isopropyl alcohol	400	Discharged to sanitary sewer; Contract disposal
		TCE	<50	Discharged to sanitary sewer; Contract disposal
		Freon®	200	Discharged to sanitary sewer; Contract disposal
5. Rockwell International	765	Hydrazine	<1 gal/ launch (Atlas)	Neutralized and discharged to grade; CD

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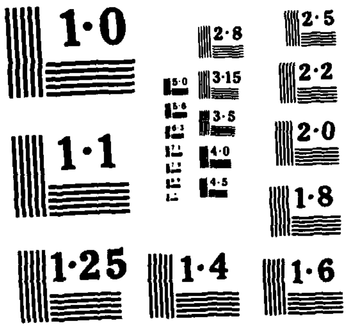

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Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 29 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
6. Martin-Marietta Corp.				
a. Titan Missile Program	8401	Nitrogen tetroxide and neutralization water	25 gal/launch	Neutralized and discharged to grade
		Aerozine 50	150	Neutralized and discharged to grade
		IRFNA-contaminated neutralization water	1,500 gal/launch	Discharged to grade
		Aerozine-contaminated neutralization water	930,000	Discharged to grade
		Lube oil	150	Camp Cooke landfill; BFT; Contract disposal
		Paint slops	50	Camp Cooke landfill; VAFB landfill; Contract disposal
		Solvents	100	Evaporated at job site
b. Peacekeeper Missile Program	1800	Cadmium-contaminated insulation rinse water	450 gal/launch	CD
		Hydrochloric acid	60 gal/launch	CD

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 30 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980 – 1984)
7. ITT-FEC				
a. Paint Shop	9320 (1974-present)	Paint slops	<100	Navy landfill → VAFB landfill →
		Lacquer thinner	<50	Job site evaporation → Contract disposal →
	S. VAFB (1959-1974)	Sandblasting residue	Variable	Landspread at job site → Recycled →
b. Parts-Cleaning Shop	9320 (1974-present)	Iridite solution	200†	Discharged to sanitary sewer → Contract disposal →
	S. VAFB (1959-1974)	Hydrofluoric acid	200†	Discharged to sanitary sewer → Contract disposal →
c. Electric Motor Shop	9320 (1974-present) S. VAFB (1959-1974)	Lube oil	Variable	Navy landfill → VAFB land-fill → Contract disposal →

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 31 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices
8. Lockheed Missile and Space Co.				
a. Paint Shop	8310	Paint strippers	50	VAFB landfill (1960–1984)
		Paint slops	Variable	VAFB landfill (1960–ca. 1984); CD (ca. 1984 →)
		Solvents (mostly MEK)	50	VAFB landfill (1960–ca. 1984); CD (ca. 1984 →)
		Methylene chloride	100	VAFB landfill (1960–ca. 1984); CD (ca. 1984 →)
		Rags	Variable	Laundry service (1960–1984, dashed)

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 32 of 34)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
b.	Heavy Equipment Maintenance Shop	8310	Lube oil	150	1960–1984: VAFB landfill; 1984→: CD
			Solvents	25	1960–1984: VAFB landfill; 1984→: CD
			TCE	25	1960–1984: VAFB landfill; 1984→: CD
			Freon®	200	1960–1984: VAFB landfill; 1984→: CD
c.	Valve-Cleaning Shop	8310	Paint slops	Variable	1960–1984: VAFB landfill; 1984→: CD
			Solvents	Variable	1960–1984: VAFB landfill; 1984→: CD
9.	Stearns-Rodgers, Inc.				
a.	Corrosion Control Shop	1792	Paint slops	100	Job site ground disposal; CD
			Solvent (Shell Oil Co. product)	50	CD
			Xylene	50	Job site evaporation
			Lube oil	400	Job site ground disposal; CD

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 33 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
10. General Dynamics				
a. Atlas Launch Facility	SLC-3 7525 8305	Lube oil and hydraulic fluids	1,400	Camp Cooke landfill → VAFB landfill → Contract disposal →
		Mixed solvents	400	Camp Cooke landfill → VAFB landfill → Contract disposal →
		TCE	1,430	Camp Cooke landfill → VAFB landfill → Contract disposal →
		TCE and dilution water	550,000	Discharged to grade →
11. Boeing Aerospace Corp.--Paint Shop	6525	Xylene	100	Job site evaporation → CD →
		MEK	100	Job site evaporation → CD →
		Toluene	50	Job site evaporation → CD →
		Paint-booth filters	Variable	VAFB landfill →
		Sodium chromate solution	200†	Job site disposal → CD →

Table 4.1-1. Vandenberg AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 34 of 34)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1984)
12. McDonnell-Douglas—Delta-Thor Launch Facility	SLC-2 1625	Hydrazine	<5	1960–1980: Neutralized and discharged to grade; 1980–1984: CD
		Hydrazine-contaminated neutralization water	31,000	1960–1980: Neutralized and discharged to grade; 1980–1984: CD
		Nitrogen tetroxide	<2	1960–1980: Neutralized and discharged to grade; 1980–1984: CD
		Neutralization water contaminated with nitrogen tetroxide	17,000	1960–1980: Neutralized and discharged to grade; 1980–1984: CD
		TCE	250	1960–1965: VAFB landfill; 1965–1984: Contract disposal
		Isopropyl alcohol	150	1960–1965: VAFB landfill; 1965–1984: Contract disposal
		Freon® 113	400	1960–1965: VAFB landfill; 1965–1984: Contract disposal

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.
†Waste quantity does not include dilution waters.

Key:

————	Confirmed timeframe and disposal data from shop personnel.
- - - -	Estimated timeframe and disposal data from shop personnel.
ICBM	Intercontinental ballistic missile.
IRFNA	Inhibited red fuming nitric acid.
UDMH	Unsymmetrical dimethyl hydrazine.
MMH	Monomethyl hydrazine.
TCE	Trichloroethylene.
BFT	Burned in firefighter training.
MEK	Methyl ethyl ketone.
CD	Contract disposal.

Pneudraulic Shop

The Pneudraulic Shop (Bldg. 6601) is responsible for the maintenance of hydraulic systems within the 394th ICBMTMS. Wastes generated include Stoddard solvent (10 gal/yr) and hydraulic fluid (360 gal/yr). Stoddard solvent replaced other various solvents (most of which are believed to have been chlorinated) around 1970. Since 1960, disposal of solvents has been through onsite evaporation from metal catch basins. Hydraulic fluid has been contract disposed since 1960.

Mechanical Shop

The Mechanical Shop (Bldg. 6601) generates waste oil at a rate of less than 50 gal/yr. The waste oil has been contract disposed since 1960. No other waste materials are generated in significant quantities.

Power, Refrigeration, and Electrical Shop

The Power, Refrigeration, and Electrical Shop (Bldg. 6601) generates sulfuric acid (60 gal/yr) and a sodium chromate solution (100 gal/yr). Spent sulfuric acid is neutralized prior to being released to the sanitary sewer. The sodium chromate solution was landfilled at the VAFB landfill from 1960 to 1976 and has been contract disposed since 1976.

Electromechanical Shop

The only waste material of significance generated from the Electromechanical Shop (Bldg. 6601) is sodium chromate (60 gal/yr, average). The waste sodium chromate solution is disposed of with wastes generated from the Power, Refrigeration, and Electrical Shop.

Missile Handling Team

The Missile Handling Team (Bldg. 8337) generates primarily waste paint stripper (5 gal/yr) and hydraulic fluid (25 gal/yr). The waste paint stripper has always been landfilled at VAFB; the hydraulic fluids have been contract disposed since 1960.

Refurbishing/Corrosion Control Shop

The Refurbishing/Corrosion Control Shop (Bldg. 1930) provides painting support for the 394th ICBMTMS. Wastes generated include waste paint (100 gal/yr) and paint thinner (100 gal/yr). From 1960 to 1976, waste paint was taken to the VAFB landfill; since 1976, waste paint has been contract disposed. From 1960 to 1976, waste paint thinner was allowed to evaporate on the ground at various job sites; contract disposal began in 1976.

4.1.1.2 4392ND AEROSPACE SUPPORT GROUP

ADMINISTRATION DIVISION

Printing Plant

The 4392nd ASG Printing Plant is located in Bldg. 7425. Spent silver solution (12 gal/yr) and film pieces are the only significant waste materials generated. Both waste products are sent to the 1369th AVS for silver recovery.

SERVICES DIVISION

Cafeterias

The primary waste product from the base cafeterias (Bldg. 10343B) is refuse and food waste. Waste quantities were reported to be 3,285 cubic yards per year (yd^3/yr). Disposal has been through landfilling at the Camp Cooke landfill from 1942 to 1960 and at the VAFB landfill since 1960.

Service Station

The Service Station (Bldg. 10600) became operational in 1967. Waste materials contract disposed since 1967 include lube oil (3,000 gal/yr) and Texaco parts-cleaner solvent (60 gal/yr). Automotive batteries (420/yr) and brake shoes (variable quantities) have always been returned to the manufacturers for credit.

Diluted ethylene glycol has been discharged to the storm drain since 1967. Oil and fuel filters have been landfilled since 1967. Cleaning rags are cleaned by a local laundry service.

SUPPLY SQUADRON

Agena Tank Farm

The Agena Tank Farm (Bldgs. 1180-1196) generates waste inhibited red fuming nitric acid (IRFNA) (35 gal/yr), IRFNA-contaminated neutralization water (44,000 gal/yr), waste unsymmetrical dimethyl hydrazine (UDMH) (<5 gal/yr), UDMH-contaminated neutralization water (10,000 gal/yr), and monomethyl hydrazine (MMH) (<5 gal/yr). Waste fuel (containing Aerozine 50, UDMH, and N_2H_4) (80 gal/yr) and fuel-contaminated neutralization water (52,000 gal/yr) were generated from 1961 to 1984. The neutralization waters have been discharged to grade since 1961. Since 1961, waste IRFNA has been neutralized in a lined pond prior to being discharged to grade. Waste UDMH and MMH were neutralized and discharged to grade from 1961 to early 1984, when contract disposal began. Waste fuel was neutralized and discharged to grade.

Titan Tank Farm

The Titan Tank Farm (Bldgs. 6830-6836) produces waste nitrogen tetroxide (N_2O_4) (<5 gal/yr), neutralization water contaminated with N_2O_4 (1,000 gal/yr), Aerozine 50 (<5 gal/yr), and neutralization water contaminated with Aerozine 50 (25,500 gal/yr). Waste N_2O_4 from transfer operations is burned in a propane-fired pollution control system. Aerozine 50 was neutralized in a lined pond and discharged to grade with the contaminated neutralization waters from 1963 to 1984, when contract disposal began.

CIVIL ENGINEERING SQUADRON

Power Production Section

Field Power Shop--The Field Power Shop (Bldg. 11439) maintains portable and mobile electrical generators for basewide use. Wastes generated from normal operations include lube oil (2,000 gal/yr), ethylene glycol (500 gal/yr), and degreasing solvent (110 gal/yr). Waste oil and degreasing solvent are suspected to have been landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract

disposed since 1965. Diluted ethylene glycol has been discharged to grade at the job site since 1942.

Manned Power Shop--The Manned Power Shop facilities (located throughout the base) provide power for remote areas. Wastes generated include lube oil (3,000 gal/yr), aircraft-cleaning compound (300 gal/yr), paint remover (700 gal/yr), floor-cleaning compound (700 gal/yr), and calcium hypochlorite (1,000 lb/yr). Waste lube oil was burned in firefighter training from 1960 to 1965 and has been contract disposed since 1965. The aircraft-cleaning compound, paint remover, floor-cleaning compound, and calcium hypochlorite have been discharged to storm drains since 1960.

Pavement and Grounds Section

Heavy Equipment Maintenance Shop--The Heavy Equipment Maintenance Shop (Bldg. 10715) generates waste hydraulic fluid (100 gal/yr), lube oil (200 gal/yr), and aircraft-cleaning compound (55 gal/yr). The hydraulic fluid and lube oil was disposed of through landfilling from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. The aircraft-cleaning compound has been discharged to a storm drain since 1960.

Pavements Shop--The Pavements Shop (Bldgs. 717, 720, and 10715) generates waste diesel fuel (150 gal/yr) and kerosene (200 gal/yr), which are used to clean tools. These wastes are allowed to evaporate on the ground at the job sites. The aircraft-cleaning compound (55 gal/yr) has always been discharged to storm drains. Lube oil (250 gal/yr) and hydraulic fluid (100 gal/yr) were landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present.

Structures Section

Protective Coatings Shop--The Protective Coatings Shop (Bldg. 11439) generates paint slops and waste latex paints (75 gal/yr), oil-based paints (1,000 gal/yr from 1942 to 1976 and 10 gal/yr from 1976 to

present), thinner (500 gal/yr), paint remover (240 gal/yr), sandblasting residue (79,000 lb/yr), and rags (variable quantity). The paint wastes and thinners were landfilled from 1942 to 1960, disposed of at the job site from 1960 to 1974, and contract disposed from 1974 to present. Reportedly, paint removers have been disposed of at the job site since 1942. Unusable rags have been landfilled since 1942, and sandblasting residue has been used as sandbag material or landfilled since 1942.

Masonry Shop--The only waste material of significance generated from the Masonry Shop (Bldg. 7303) is muriatic acid (25 gal/yr), which is discharged to a storm drain in a diluted form.

Mechanical Section

Refrigeration/Air Conditioning Shop--The Refrigeration/Air Conditioning Shop (Bldg. 11352) generates waste ethylene glycol (1,200 gal/yr); Freon® 111 and 113 (500 gal/yr); Freon® 11, 12, and 22 (1,500 lb/yr); and compressor oil (1,200 gal/yr). Waste diluted ethylene glycol has been discharged to the sanitary sewer since 1942. Freon® 111 and 113 were landfilled from 1955 to 1974 and have been contract disposed since 1974. Freon® 11, 12, and 22 have always been vented to the atmosphere. Lube oil was landfilled from 1957 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present.

Liquid Fuels Maintenance Shop--The Liquid Fuels Maintenance Shop was located in Bldg. 11439 from 1960 to 1971, when it was moved to Bldg. 11352. Wastes generated include lube oil (55 gal/yr), contaminated fuels (300 gal/yr), tetrachloroethylene (55 gal/yr), tricresylphosphate (55 gal/yr), and a variable amount of fuel sludges. The lube oil and contaminated fuels were landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. Fuel sludges were landfilled from 1942 to 1965, when contract disposal began. The tetrachloroethylene and tricresylpnosphate were landfilled from 1942 to 1960 and contract disposed from 1960 to present.

Heating Shop--The Heating Shop (Bldg. 11352) generates boiler blowdown (850 gal/yr), resin regeneration salt and chemicals (25,600 lb/yr), and boiler-cleaning chemicals (16,900 gal/yr). The boiler-cleaning chemicals have been neutralized and discharged with the regeneration salts and chemicals to the sanitary sewer system since 1942. The boiler blowdown is discharged to the sanitary sewer.

Electrical Section

Exterior Electric Shop--The Exterior Electric Shop (Bldg. 11434) is responsible for maintenance of the power transformers, distribution lines, and related equipment. Wastes generated include transformer oil (300 gal/yr) and variable quantities of transformer carcasses, transformer oil filters, and light-fixture ballasts (potential PCB contamination). It is reported that from 1942 to 1977 (pre-PCB regulations), waste transformer oil was disposed of with other waste POL materials (i.e., landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to 1977). Since 1977, both PCB-contaminated and non-PCB-contaminated transformer oils have been contract disposed but by different techniques (see Sec. 4.1.4 for details). Transformer oil filters and light-fixture ballasts were landfilled from 1942 to 1977, when contract disposal began. Transformer carcasses have been contract disposed since 1942.

Sanitation Section

Water Treatment Plants--Two water treatment plants provide potable water for VAFB--the Santa Ynez plant (Bldg. 1200) and the San Antonio plant (Bldg. 22310). The Santa Ynez plant has been in operation since 1942 and treats water through lime softening, chlorination, and fluorination. Deionized water is batch produced monthly at this facility. Waste generation includes softening sludges (1.2 million lb/yr) and ion exchange resin regeneration water (80 lb/mo of sulfuric acid diluted in 2,500 gal of rinse water and 50 lb/mo of caustic soda diluted in 2,500 gal of rinse water). Since 1942, sludges have been dried and stockpiled adjacent to Bldg. 1200, and the resin regeneration water has been diluted and discharged to an evaporation/percolation pond.

Lockheed Space and Missile Co. Photographic Laboratory

This laboratory, located in Bldg. 8310, generates waste fixer (50 gal/yr), waste developer (100 gal/yr), and rinse waters containing traces of photographic developing chemicals. Until early 1984, all waste solutions were disposed of in the sanitary sewer system. Currently, photographic fixers and developers are drummed and contract disposed by Lockheed Space and Missile Co.

USAF Hospital

The major waste generated by the USAF hospital laboratories (clinical and dental X-ray) is waste photographic solutions. These solutions are sent to the 1369th AVS for silver recovery. Other dilute wastewaters generated from chemical analysis procedures at the hospital are disposed of in the sanitary sewer. Currently, the hospital is located in Bldg. 13850, which was constructed in 1967. From 1941 to 1966, the base hospital was located in the 12000 series of buildings.

Federal Electric Corporation Photographic Laboratory

This photographic laboratory sends all waste photographic solutions to the 1369th AVS for silver recovery and disposal.

Energy Management Laboratory

The Energy Management Laboratory (known as the Aerospace Fuels Laboratory until 1981) is located in Bldg. 7422. The laboratory has approximately doubled in size during the past 20 years. Chemical solutions, including some solvents, have always been disposed of in the sanitary sewer system. Other solvents and fuel samples were formerly picked up by contractors and burned. Currently, solvents and fuel samples are stored in drums at the laboratory until full, then transferred to the VAFB hazardous waste storage area at SLC-1.

4.1.3 PESTICIDE HANDLING, STORAGE, AND DISPOSAL

Pesticides have been and are being used by the 4392nd CES Pest Management Unit to maintain grounds and structures and to prevent

laboratories), the Energy Management Laboratory, the ITT-FEC Photographic Laboratory, and the Lockheed Missile and Space Co. Photographic Laboratory.

1369th Audiovisual Squadron

The 1369th AVS operates photographic laboratories for the processing of black-and-white print film, color print film, and motion-picture film. The laboratory has been located in Bldg. 8314 since it was constructed in 1958. Until the early 1960s, all wastewaters (including photographic developers and fixers) were disposed of to the sanitary sewer system without silver recovery. Starting in the early 1960s, the base initiated a program for silver recovery. Currently, developers and fixers (100 gal/month) are treated for silver recovery and disposed of in the sanitary sewer system. Other rinse waters containing traces of fixers and developers, with trace quantities of acetone, ethylenediamine tetraacetic acid, methylamine sulfate, hydroquinone, acetic acid, potassium hydroxide, sulfuric acid, sulfamic acid, potassium dichromate, sodium hypochlorite, isopropyl alcohol, benzyl alcohol, boric acid, ceric sulfate, 4-amino-n-ethyl-m-toluidine, ethyl acetate, formaldehyde, methanol, magnesium sulfate, iodine, potassium bromide, potassium ferricyanide, potassium iodate, potassium iodide, sodium acetate, sodium phosphate, sodium sulfite, sodium hexametaphosphate, sodium thiocyanate, and sodium thiosulfate, are also disposed of in the sanitary sewer system. However, due to the limited amount of film processing, this disposal practice is acceptable (40 CFR, Part 261). Recovered silver and film scraps are sent to DPDO. The 1369th AVS also recovers silver from solutions generated at the hospital (medical and dental X-ray) and from the ITT-FEC Photographic Laboratory.

Navy Photographic Laboratory

The Navy operated a photographic laboratory on South VAFB from 1958 to 1964. The location of this operation, quantities of waste, and disposal procedures could not be determined from existing records. It is suspected that the quantities were small and the wastes were disposed of in the sewage treatment lagoon.

fluids (1,400 gal/yr), mixed solvents (400 gal/yr), TCE (1,430 gal/yr), and TCE and dilution water (350,000 gal/yr). It was reported that these waste materials were landfilled from 1958 to 1965 and contract disposed from 1965 to present, except the TCE and dilution water, which has been discharged to grade since 1960.

BOEING AEROSPACE CORPORATION

Paint Shop

Boeing Aerospace Corporation operates a paint shop out of Bldg. 6525. Wastes generated include xylene (100 gal/yr), MEK (100 gal/yr), toluene (50 gal/yr), paint-booth filters (variable), and sodium chromate solution (200 gal/yr). From 1961 to 1983, the waste xylene, MEK, toluene, and sodium chromate solution were allowed to evaporate at the job site. Since 1983, these wastes have been contract disposed. Spent paint-booth filters have always been landfilled.

MCDONNELL-DOUGLAS

Delta-Thor Launch Facility

The Delta-Thor launch facility (SLC-2, Bldg. 1625) was operated from 1958 to April 1984. McDonnell-Douglas operated this facility for NASA. Waste generation included hydrazine (<5 gal/yr), hydrazine-contaminated neutralization water (31,000 gal/yr), nitrogen tetroxide (<2 gal/yr), nitrogen-tetroxide-contaminated water (17,000 gal/yr), TCE (250 gal/yr), isopropyl alcohol (150 gal/yr), and Freon® 113 (400 gal/yr). Hydrazine, hydrazine-contaminated water, nitrogen tetroxide, and nitrogen-tetroxide-contaminated water were disposed of by neutralization and discharge to grade from 1958 to 1981 and were contract disposed from 1981 until operational shutdown in 1984. Waste TCE, isopropyl alcohol, and Freon® 113 were landfilled from 1958 to 1965 and contract disposed from 1965 to 1984.

4.1.2 LABORATORY ACTIVITIES

Laboratory operations at VAFB are performed by the 1369th AVS Photographic Laboratory, the VAFB Hospital (clinical and dental

LOCKHEED MISSILE AND SPACE COMPANY

Paint Shop

The Lockheed Paint Shop (Bldg. 8310) generates waste paint strippers (50 gal/yr), paint slops (variable), MEK and other solvents (50 gal/yr), methylene chloride (100 gal/yr), and rags (variable quantity). These wastes were landfilled from 1960 to 1983 and contract disposed from 1983 to present (except paint strippers, which are still landfilled). Soiled rags have always been cleaned by a laundry service.

Heavy Equipment Maintenance Shop

The Lockheed Heavy Equipment Maintenance Shop (Bldg. 8310) generates waste lube oil (150 gal/yr), TCE (25 gal/yr), solvents (25 gal/yr), and Freon® (200 gal/yr). These wastes were disposed of through landfilling from 1960 to 1983 and contract disposed from 1983 to present.

Valve-Cleaning Shop

Reportedly, the only wastes generated from the Lockheed Valve-Cleaning Shop (Bldg. 8310) are variable amounts of paint slops and solvents (type unknown). Disposal of the waste paint slops and solvents was by landfilling from 1960 to 1983 and contract disposal from 1983 to present.

STEARNS-RODGERS, INC.

Corrosion Control Shop

Wastes generated from the Stearns-Rodgers Corrosion Control Shop (Bldg. 1792) include paint slops (100 gal/yr), a Shell Oil Company solvent (50 gal/yr), xylene (50 gal/yr), and lube oil (400 gal/yr). The xylene was used as a solvent from 1962 to 1981, when a Shell Oil Company product was introduced. These materials were disposed of at the job site from 1962 to 1981 and contract disposed from 1981 to present.

GENERAL DYNAMICS

Atlas Launch Facility

Operations at the Atlas Launch Facility (SLC-3, Bldg. 7525, and Bldg. 8305) result in the generation of waste lube oil and hydraulic

Wastes generated as a result of each Peacekeeper missile launch include 450 gal per launch of insulation rinsewater (contaminated with cadmium) and 60 gal per launch of hydrochloric acid. Both of these wastes have been contract disposed since operational startup of the Peacekeeper missile program in 1982.

INTERNATIONAL TELEPHONE AND TELEGRAPH-FEDERAL ELECTRIC CORPORATION

Paint Shop

The ITT-FEC Paint Shop provides corrosion control maintenance for antenna systems at VAFB. The Paint Shop was located at South VAFB from 1959 to 1974 before being moved to Bldg. 9320. Wastes generated included paint slops (<100 gal/yr), lacquer thinner (<50 gal/yr), and sandblasting residue (variable quantity). Waste paint slops were landfilled at the Navy landfill at South VAFB from 1959 to 1974 and at the VAFB landfill from 1974 to present. From 1959 to 1978, lacquer thinner was allowed to evaporate at the job site; contract disposal of lacquer thinner was begun in 1978. Sandblasting residue was landspread at the job site from 1959 to 1978 and recycled from 1978 to present.

Parts-Cleaning Shop

The Parts-Cleaning Shop has always been located in the same building as the Paint Shop. Wastes produced include iridite solution (200 gal/yr) and hydrofluoric acid (200 gal/yr). Both wastes were discharged directly to the sanitary sewer from 1959 to 1978 and contract disposed from 1978 to present.

Electric Motor Shop

The Electric Motor Shop (located in same building as the Paint Shop) produces mainly waste lube oil at a variable rate. Disposal was through landfilling at the Navy landfill from 1959 to 1974, landfilling at the VAFB landfill from 1974 to 1976, and contract disposal from 1976 to present.

wastes include spent plating solution (<100 gal/yr), plating rinse water (5,000 gal/yr), and plating sludge (2 gal/yr). In 1975, Bionetics began a program to contract dispose of the plating solutions and sludges. The rinse is still neutralized and discharged to the sanitary sewer.

Parts-Cleaning Shop wastes include acid cleaning solution and rinse water (500,000 gal/yr), alkaline cleaning solution and rinse water (500,000 gal/yr), isopropyl alcohol (400 gal/yr), TCE (<50 gal/yr), and Freon® (200 gal/yr). The acid and alkaline solutions and rinse waters have continued to be neutralized prior to discharge to the sanitary sewer. The isopropyl alcohol, TCE, and Freon® were discharged directly to the sanitary sewer from 1975 to 1978, when contract disposal began.

ROCKWELL INTERNATIONAL

Waste generation as a result of Rockwell International operations (Bldg. 765) is basically limited to small amounts of hydrazine (<1 gal per Atlas missile launch). From 1978 to 1982, waste hydrazine was neutralized and discharged to grade. Since 1982, waste hydrazine has been contract disposed.

MARTIN-MARIETTA CORPORATION

Martin-Marietta Corporation (Bldg. 8401) provides launch support for the Titan and Peacekeeper missile programs. Wastes generated from the Titan missile program include N_2O_4 and neutralization water (25 gal launch), Aerozine 50 (150 gal/yr), IRFNA-contaminated neutralization water (1,500 gal per launch), neutralization water contaminated with Aerozine 50 (930,000 gal/yr), lube oil (150 gal/yr), paint slops (50 gal/yr), and solvents (100 gal/yr). Waste fuels have been neutralized and discharged to grade since 1958. Waste lube oil was landfilled from 1958 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. Paint slops were landfilled until 1976, when contract disposal began. Waste solvents have been allowed to evaporate at the job site since 1958.

water (500,000 gal/yr) and alkaline cleaning solution and rinse water (500,000 gal/yr). Both waste streams were neutralized prior to being discharged to the sanitary sewer.

CON AM SERVICES

Con Am Services took over operations of the Parts-Cleaning Shop from Wiley Labs in 1965. In 1966, the Shop was moved to Bldg. 8130. In 1969, Con Am built the Metal-Plating Shop for the plating of specialty items. Con Am operated both shops until 1972.

Wastes generated from the Metal-Plating Shop consisted of plating solution and rinse water (250,000 gal/yr). Disposal consisted of neutralization and discharge to the sanitary sewer. Waste types and disposal methods for the Parts-Cleaning Shop remained the same when Con Am took over operations from Wiley Labs. The only difference was in waste generation rates, which increased to 750,000 gal/yr for both waste streams.

BENDIX CORPORATION

Bendix Corporation took over operation of the Parts-Cleaning Shop and Metal-Plating Shop from Con Am in 1972. Operations remained basically the same from 1972 to 1975, when Bionetics assumed control of the shops. Waste generation from both shops also remained basically the same, with the only difference being waste generation rates. Waste plating solution (500 gal/yr), plating rinse water (5,000 gal/yr), acid cleaning solution and rinse water (500,000 gal/yr), alkaline cleaning solution and rinse water (500,000 gal/yr), and isopropyl alcohol (500 gal/yr) were neutralized and discharged to the sanitary sewer.

BIONETICS

Bionetics assumed control of the Parts-Cleaning Shop and Metal-Plating Shop in 1975. Operations remained the same, with the only difference being a decrease in most waste generation rates and an increase in waste generation types from the Parts-Cleaning Shop. Metal-Plating Shop

(360 gal/yr), Stoddard solvent (100 gal/yr), nickel-cadmium battery solution (<25 gal/yr), battery carcasses (2/yr), paint slops (25 gal/yr), and aircraft-cleaning compound (50 gal/yr). Since 1973, the waste lube oil, Stoddard solvent, paint slops, and battery carcasses have been contract disposed. The nickel-cadmium battery solution has been neutralized and discharged to the sanitary sewer since 1973. The aircraft-cleaning compound has always been discharged to a storm drain.

Aerospace Ground Equipment Shop

The AGE Shop (Bldg. 1735) is responsible for maintenance of ground equipment supporting rescue and recovery operations. Wastes generated include lube oil (50 gal/yr), Stoddard solvent (25 gal/yr), hydraulic fluid (50 gal/yr), contaminated fuels (variable quantities), MEK (25 gal/yr), battery acid (2 gal/yr), battery carcasses (4/yr), and aircraft-cleaning compound (55 gal/yr). Since 1973, the waste lube oil, Stoddard solvent, hydraulic fluid, contaminated fuels, MEK, and battery carcasses have been contract disposed. The battery acid and cleaning compound are included with wastes from the Helicopter Shop for disposal.

GENERAL SERVICES ADMINISTRATION

Vehicle Maintenance Shop

The GSA Vehicle Maintenance Shop (Bldg. 875), which has been in operation since 1974, produces waste lube oil (2,000 gal/yr), lacquer thinner (12 gal/yr), Stoddard solvent (360 gal/yr), batteries (250/yr), tires (2,000/yr), brake shoes, paint-booth filters, and oil and fuel filters. These waste materials have been contract disposed since 1974, except brake shoes, which are returned to the manufacturer for credit, and oil filters, which have been landfilled since 1974.

WILEY LABORATORIES

Wiley Laboratories was contracted to operate the base Parts-Cleaning Shop from 1961 to 1965. At that time, the facility was housed in Bldg. 3319. Wastes generated included acid cleaning solution and rinse

Aero Repair Shop

The Aero Repair Shop (Bldg. 1728) primarily generated paint stripper (110 gal/yr) and Stoddard solvent (60 gal/yr). Waste paint stripper was discharged to a storm drain. Stoddard solvent, used from 1970 to 1975, was always contract disposed.

4.1.1.3 TENANTS

AIR FORCE LOGISTICS COMMAND SUPPORT GROUP, DET. 41

Paint Shop

Wastes generated from the Paint Shop (Bldg. 9327) include lacquer thinner (200 gal/yr), cellulose nitrate (200 gal/yr), a synthetic thinner (50 gal/yr), paint slops (50 gal/yr), mineral spirits (50 gal/yr), and paint-booth filters (variable). It was reported that these waste materials, except paint-booth filters, have been contract disposed since 1969. Paint-booth filters have been landfilled since 1969.

Machine Shop

The Det. 41 Machine Shop (Bldg. 9320) generates waste Stoddard solvent (25 gal/yr), hydraulic fluid (180 gal/yr), and lube oil (60 gal/yr). These waste materials have been contract disposed since 1969.

Nondestructive Inspection Shop

The Nondestructive Inspection Shop (Bldg. 1892) uses X-ray analysis for the inspection and certification of material that cannot be otherwise inspected. Wastes generated from normal operations include a spent silver solution (30 gal/yr) and soiled rags (variable quantity). The spent silver solution has been sent to the 1369th AVS for silver recovery since 1969. Soiled rags are landfilled.

37TH AEROSPACE RESCUE AND RECOVERY SQUADRON, DET. 8

Helicopter Maintenance Shop

The Helicopter Maintenance Shop (Bldg. 1735) began operation at VAFB in 1973. Wastes generated through normal operations include lube oil

Welding Shop

The Welding Shop (Bldg. 1728) generated only waste kerosene at a rate of 30 gal/yr. Disposal was through burning in firefighter training from 1961 to 1965 and contract disposal from 1965 to 1975.

Pneudraulic Shop

The Pneudraulic Shop (Bldg. 1728) generated mainly waste hydraulic fluid (120 gal/yr), which was disposed of in the same manner as kerosene from the Welding Shop.

Corrosion Control Shop

The Corrosion Control Shop (Bldg. 1728) generated waste methyl ethyl ketone (MEK) (240 gal/yr), acetone (100 gal/yr), toluene (240 gal/yr), lacquer thinner (180 gal/yr), an alodine rinse water (variable quantity), paint stripper (25 gal/yr), Stoddard solvent (25 gal/yr), and paint slops (100 gal/yr). The waste MEK, acetone, toluene, and lacquer thinner were burned in firefighter training from 1961 to 1965 and contract disposed from 1965 to 1975. The waste alodine rinse water and paint stripper were discharged to a storm drain from 1961 to 1975. The waste Stoddard solvent was contract disposed from 1970 to 1975. Waste paint slops were landfilled from 1961 to 1975.

Organizational Maintenance Shop

The Organizational Maintenance Shop (Bldg. 1735) generated primarily waste lube oil (1,200 gal/yr) and hydraulic fluid (180 gal/yr). Both waste materials were disposed of by burning in firefighter training from 1961 to 1965 and contract disposal from 1965 to 1975.

Machine and Structural Shop

The Machine and Structural Shop (Bldg. 1728) generated approximately 25 gal/yr of MEK. The waste MEK was disposed of in the same manner as wastes from the Organizational Maintenance Shop.

changed in 1970 from a chlorinated type to Stoddard solvent. The waste transmission fluid, hydraulic fluid, solvents, and lube oil were landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. Waste diluted ethylene glycol was discharged to a storm drain from 1942 to 1976, when contract disposal began. Since 1960, the waste aircraft-cleaning compound has been discharged to a storm drain. Oily rags have been landfilled since 1942.

Refueling Maintenance Shop

The Refueling Maintenance Shop (Bldg. 7501) generates waste ethylene glycol (660 gal/yr), hydraulic fluid (500 gal/yr), lube oil (720 gal/yr), solvents (420 gal/yr), aircraft-cleaning compound (300 gal/yr), oil filters (25 drums/yr), and rags (variable quantity). Solvent type was changed in 1970 from a chlorinated type to Stoddard solvent. The waste hydraulic fluid, lube oil, and solvents were landfilled from 1942 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. Waste diluted ethylene glycol was discharged to a storm drain from 1942 to 1976 and has been contract disposed since 1976. Since 1960, waste aircraft-cleaning compound has been discharged to a storm drain. Used oil filters were landfilled from 1942 to 1979, when contract disposal began. Oily rags have always been landfilled.

Battery Shop

Wastes generated from the Battery Shop (Bldg. 10726A) include battery acid (300 gal/yr), battery carcasses (600/yr), and rags (variable quantity). Since 1960, battery acid has been neutralized and discharged to the sanitary sewer, battery carcasses have been contract disposed, and rags have been landfilled.

CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON

This squadron began operation in 1961 and was decommissioned in 1975, when aircraft stationed at VAFB were reassigned.

General Purpose Shop

The General Purpose Shop (Bldg. 10726A) provides a majority of the ground vehicle maintenance at VAFB. Typical wastes generated include trichloroethylene (TCE) (660 gal/yr), Stoddard solvent (1,320 gal/yr), an aromatic solvent (300 gal/yr), hydraulic fluid (60 gal/yr), a diesel-fuel-based solvent (1,320 gal/yr), ethylene glycol (1,320 gal/yr), sulfuric acid (240 gal/yr), brake pads (1,500/yr), and brake shoes (variable quantity). The TCE, hydraulic fluid, and diesel-based solvent were disposed of through landfilling from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. The Stoddard solvent has been contract disposed since 1970. The waste aromatic solvent has been included with the waste TCE for disposal since 1960. The waste diluted ethylene glycol was discharged to a storm drain from 1942 to 1976, when contract disposal began. The waste sulfuric acid has been neutralized and discharged to a storm drain since 1960. Since 1942, used brake pads have been landfilled and used brake shoes have been returned to the manufacturer for credit.

Minor Maintenance Shop

The Minor Maintenance Shop (Bldg. 10706), which became operational in 1960, generates waste transmission fluid (60 gal/yr), brake fluid (12 gal/yr), ethylene glycol (660 gal/yr), and aromatic solvent (96 gal/yr). Waste transmission fluid, brake fluid, and solvent were burned in firefighter training from 1960 to 1965 and contract disposed from 1965 to present. Waste diluted ethylene glycol was discharged to a storm drain from 1960 to 1976 and contract disposed from 1976 to present.

Special Purpose Shop

The Special Purpose Shop (Bldg. 10713) generates waste transmission fluid (135 gal/yr), hydraulic fluid (180 gal/yr), solvents (600 gal/yr), ethylene glycol (600 gal/yr), aircraft-cleaning compound (60 gal/yr), lube oil (9,000 gal/yr), and rags (variable quantity). Solvent type was

(commercial product) have been contract disposed. The diluted ethylene glycol has been discharged to a storm drain since 1960. Spent paint-booth filters have always been landfilled.

SECURITY POLICE SQUADRON

Vehicle Maintenance Shop

The Security Police Squadron Vehicle Maintenance Shop (Bldg. 13600) is responsible for preventative maintenance of the Security Police Squadron motor pool. Wastes generated include lube oil (500 gal/yr) and variable quantities of brake shoes and oil filters. Since 1975, lube oil has been contract disposed, brake shoes have been returned to the manufacturer for credit, and oil filters have been landfilled.

TRANSPORTATION SQUADRON

Body Shop

The Transportation Squadron Body Shop (Bldg. 10726B) generates primarily paint slops (420 gal/yr), lacquer thinner (600 gal/yr), and crushed, empty paint cans (25 drums per yr, 55 gal each). Reportedly, the paint slops and empty paint cans have been landfilled since 1942. Waste lacquer thinner was allowed to evaporate on the ground at job sites from 1942 to 1965, when contract disposal began.

Base Maintenance and Equipment Shop

The Base Maintenance and Equipment Shop (Bldg. 10713) generates waste solvents (300 gal/yr), hydraulic fluid (300 gal/yr), lube oil (840 gal/yr), aircraft-cleaning compound (420 gal/yr), and oily rags. Solvent type was changed in 1970 from a chlorinated solvent to Stoddard solvent. Waste solvents, hydraulic fluid, and lube oil were landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. The aircraft-cleaning compound has been discharged to a storm drain since 1960. Oily rags have been landfilled since 1942.

The San Antonio plant, which has been in operation since 1961, treated water by ion exchange from 1961 to 1971 and by chlorination and fluorination from 1971 to present. Wastes generated from ion exchange units included brackish backwash water (unknown quantities). Disposal of the backwash water was by landspreading adjacent to the treatment facility.

Wastewater Treatment Plant--The wastewater treatment plant (Bldgs. 1100-1110) became operational in 1942 and was decommissioned in 1978, when VAFB began using the city of Lompoc wastewater treatment system. Wastes generated from the VAFB facility included sludges (variable quantity) and treated effluent [3.1 million-gallon-per-day (MGD) design capacity]. Dried sewage sludges were contract disposed. Treated effluent was discharged to the Pacific Ocean from 1942 to 1965 and discharged to manmade retention ponds ("duck ponds") from 1965 to 1978.

Fire Protection Branch

Fire Extinguisher Maintenance Shop--The Fire Extinguisher Maintenance Shop (Bldg. 9351) produces waste lube oil (40 gal/yr) and bromochlorotrifluoromethane, a dry chemical (8,000 lb/yr). Waste lube oil was landfilled from 1942 to 1960, burned in firefighter training from 1960 to 1965, and contract disposed from 1965 to present. Since 1942, the dry chemical has been either landfilled, used in firefighter training, or used in firefighting.

MORALE, WELFARE, AND RECREATION DIVISION

Auto Hobby Shop

The Auto Hobby Shop (Bldg. 6437) generates waste lube oil (3,000 gal/yr), grease (60 gal/yr), ethylene glycol (55 gal/yr), sodium hydroxide (600 lb/yr), Stoddard solvent (55 gal/yr), paint-booth filters (variable quantity), and a cold parts cleaner (15 gal/yr). Since 1960, the lube oil, greases, sodium hydroxide (used in a hot caustic bath for parts cleaning), solvent, and cold parts cleaner

pest-related health problems. Pest-control services include: (1) household, structural, health-related, and nuisance insect- and rodent-control programs; (2) weed control at security fences, parking areas, and utility sites; and (3) programs involving turf areas (e.g., golf course) and ornamental trees and shrubs.

Several buildings have been used to store pesticides, including Bldg. 839 (used by the Navy when they occupied South VAFB area from 1959-1964), Bldg. 10720 (1940s-1965), and Bldg. 11345 (since 1965). Pesticides used at the golf course have been stored in Bldg. 1310.

Pesticides wastewaters generated by Navy pesticide mixing operations (Bldg. 839) were disposed of down the sink connected to the sewage treatment lagoon. Pesticide containers were disposed of with other solid wastes and were buried in the landfill operated by the Navy. Records searched did not contain information on the quantities of pesticides used by the Navy on South VAFB.

Prior to 1965, wastewaters generated by mixing operations conducted at Bldg. 10720 were disposed of in the sanitary sewer system. Pesticide containers were disposed of with other solid wastes at the main landfills (LF-1 and LF-2). One of the major pesticides used during the 1940s, 1950s, and 1960s was dichlorodiphenyltrichloroethane (DDT).

Since 1965, the pesticide storage and mixing operations have been moved to the area of Bldg. 11345. Pesticides currently used at VAFB are mixed and completely consumed at the job site. A mixing room exists at Bldg. 11345, but it has been used as a personnel washroom, never as a pesticide mixing area. Pesticide mixing occurred on and adjacent to the washrack area at Bldg. 11347 until 1982. Rinse waters from mixing and cleanup operations were disposed of adjacent to the washrack pad and and also to the storm drainage system. Pesticide containers have been rinsed, perforated, crushed, and sent to the base landfill since the mid-1960s. DDT usage on VAFB was discontinued when stocks were depleted

in 1974. It was reported that quantities of pesticides used have decreased since the early 1960s. All personnel currently applying pesticides have completed the certification course offered by USAF at Shepherd AFB, Texas.

Pesticides (fungicides and insecticides) are used at the VAFB golf course. This operation was independent of the 4392nd CES Pest Management Unit until 1984. The rinse waters were used at the site of application until depleted. Containers have always been disposed of in the base landfill area.

4.1.4 PCB HANDLING, STORAGE, AND DISPOSAL

The VAFB electrical equipment and distribution system is maintained by the 4392nd AEROSG CES Exterior Electric Shop. Minor transformer repair and routine maintenance of the distribution system, poles, and street lights are performed by base personnel. Major repairs and maintenance are performed by offbase contractors. Records searched did not indicate any PCB spills at VAFB.

Prior to 1971, complete rebuilding of transformers was performed on all transformers (both PCB and non-PCB) in the former electrical shop (which has since been torn down), located off 4th St. Since 1971, the CES Exterior Electric Shop has been located in Bldg. 11434. The transformer carcasses have always been contract disposed through the Defense Property Disposal Office (DPDO). Waste transformer oil was included with other waste POL until 1977, from which time PCB material and PCB-contaminated materials have been disposed of through DPDO as a hazardous waste.

Since 1977, spent filters generated from the transformer oil filter press are drummed and disposed of as hazardous waste through DPDO. Prior to 1977, all filters were landfilled in the VAFB landfill.

Prior to 1977, ballast from fluorescent light fixtures (potentially PCB-contaminated) was landfilled in the VAFB landfill. Since 1977, ballast has been drummed and disposed of through DPDO as a hazardous waste.

Prior to construction of the existing transformer storage pad in 1979, a small quantity of oil-soaked soil was removed and disposed of through DPDO as hazardous waste. The soil was not tested for PCB contamination.

Available records indicate that in 1981 and 1982, respectively, 9,800 lb and 17,310 lb of PCB materials were removed from service and transferred to DPDO for disposal.

In 1983, 13,355 lb of PCB material and 41 transformers were sent to DPDO for disposal; in 1984, the quantities were 71,425 lb of material and 62 transformers.

4.1.5 POL HANDLING, STORAGE, AND DISPOSAL

The types of POL used and stored at VAFB include motor gasoline (MOGAS), diesel fuel (DF-2), fuel oil, kerosene, rocket propellant (RP-1), jet propellant (JP-4), aviation gasoline (AVGAS), liquified petroleum gas (LPG), petroleum-based solvents, hydraulic fluid, and lube oil.

In addition to fixed storage tanks, drums and smaller containers are used for aboveground storage of incoming and waste materials, mainly solvents, hydraulic fluid, and lube oil.

POL spill management is addressed in the *Spill Prevention Control and* Countermeasure (SPCC) Plan. These plans are revised regularly to ensure that they accurately reflect storage capacity and spill prevention/ containment.

Existing Aboveground POL Storage

The aboveground storage tanks range in capacity from 10 to 125,000 gal. Total aboveground storage tank capacity for MOGAS, DF-2, AVGAS, fuel oil, and JP-4 is approximately 1,354,000 gal. There were 91 aboveground tanks identified basewide, with spill-containment strutures ranging from no containment to complete concrete enclosures. The locations, POL types, capacities, and containment structures (if any) are listed in App. J. The majority of the large aboveground tanks were constructed by USAF in the early 1960s. Many of the buildings in existence since Camp Cooke have small aboveground tanks for storage of fuel oil.

Existing Underground POL Storage

A total of 121 existing underground storage tanks were identified at VAFB, with a total capacity of 579,400 gal. The locations, POL types, capacities, and containment structures (if any) are listed in App. J. The majority of the large underground tanks are used for storing MOGAS and DF-2 for vehicular use. The smaller tanks are primarily used for storing fuel oil for building heaters.

Abandoned Underground POL Storage

Approximately 500 abandoned underground tanks were identified at VAFB, ranging in capacity from 264 to 22,000 gal. The locations, POL types, capacities, and containment structures (if any) are listed in App. J. It has been reported that the abandoned underground tanks were installed at Camp Cooke during the early 1940s for storage of fuel oil for heating purposes. Most of the tanks were abandoned when the buildings they served were torn down. It has been reported that a majority of the tanks have not been excavated and could potentially contain POL. The area where the abandoned tanks may exist (see Fig. 4.1-1) will be referred to as the abandoned underground tank area (AUTA) in subsequent discussions. This area does have the potential for contamination and contaminant migration and, therefore, was ranked using the HARM process (see App. H).

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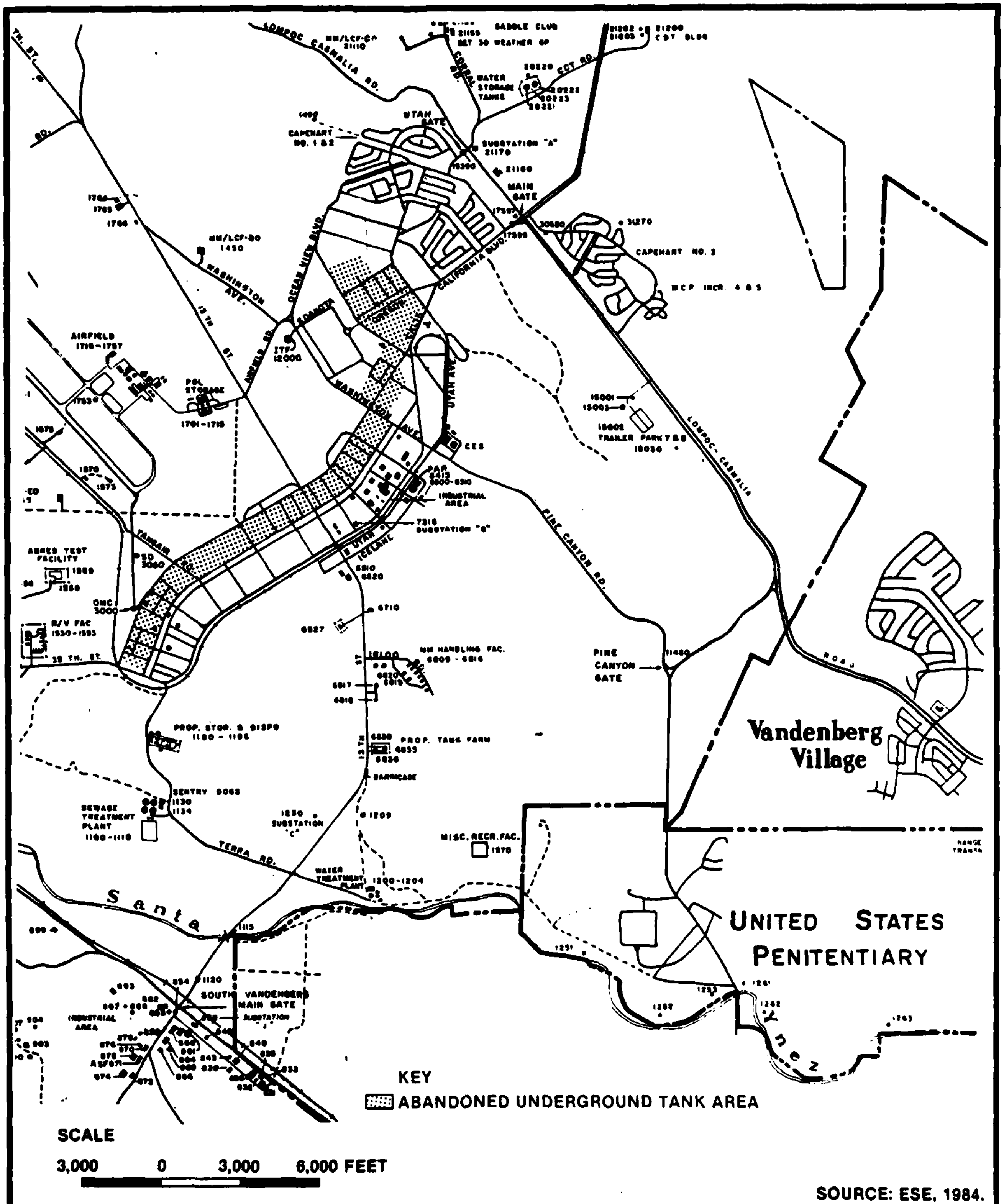

Figure 4.1-1
VAFB AREAS WHERE ABANDONED UNDERGROUND TANKS MAY EXIST

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

Waste POL Storage, Handling, and Disposal

Waste POL at VAFB include waste fuels, lube oils, petroleum-based solvents, and hydraulic fluids. The generation and disposal of waste POL are summarized in Table 4.1-1 (in Sec. 4.1.1).

Wastes are stored at their generation points in drums, aboveground tanks, and underground tanks until the maximum storage capacity is reached. Until 1960, the typical disposal practice for waste POL was landfilling in the Camp Cooke landfills. The waste POL were burned for firefighter training from 1960 to 1965 and contract disposed from 1965 to present. It is inevitable that some POL were disposed of through methods other than those listed above. Contract disposal is handled through DPDO.

Until 1978, waste solvents and hydraulic fluids were comingled with other waste POL. Currently, waste solvents are segregated and disposed of separately. Until 1978, all waste oil and fuel filters were disposed of in the Camp Cooke and VAFB landfills. Currently, most waste oil and fuel filters generated basewide are drummed and contract disposed through DPDO.

4.1.6 RADIOACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

Various types of items containing radioactive materials are stored and used on VAFB, including sealed calibration sources, analytical instrumentation, luminous dials, radiotracer leak-test gauges, and various components of missiles. An inventory of radiological sources, quantities, storage and use locations, and license authorization is maintained by the VAFB Radiation Protection Officer (RPO).

The Bomarc missiles tested at VAFB in the past each contained approximately 240 lb of thorium/magnesium alloy (approximately 4 percent Thorium 232, or 10 lb). The thorium, although radioactive, did not present any potential chemical hazard or external radiation hazard while in the alloy form. The potential health hazard was associated with the

fabrication of the missile (inhalation of dust particles from grinding) or the inhalation of fumes from welding or burning of the alloy (Anonymous, 1960). Three of the Bomarc missiles crashed and partially burned on VAFB during testing activities. Records indicate that two of the crash wreckages were buried at a depth of 8 to 12 ft near the Bomarc launch site. These burial sites are recorded on the base Master Plan maps. The wreckage from the third Bomarc crash was buried in the current base landfill. No contaminant migration problems are anticipated from these burial locations.

4.1.7 EXPLOSIVE/REACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

Explosive/reactive material at VAFB has been disposed of at the Explosive Ordnance Disposal (EOD) range (Bldg. 1565), located southwest of the main runway on Mira Rd. The EOD range consists of a burn kettle contained within a bermed enclosure. Ordnance to be disposed of is stored in two locations, depending on the size of the explosive. Small-arms ammunition and blasting caps are stored in Bldg. 1543 at the EOD range. Larger explosive material is stored in Bldg. 1565 at the EOD range. Access to both storage areas is controlled. Operations at the current EOD range began in the late 1950s to early 1960s. Prior to the late 1950s, unexploded ordnance (UXO) was disposed of in a number of onbase landfills (see Table 4.2-1 in Sec. 4.2.1). Typical explosive/reactive material disposed of at the EOD range is presented in Table 4.1-2. Unburnable debris is disposed of in a small burial pit located adjacent to the burn area.

Table 4.1-2. Typical Explosive/Reactive Material Disposed of at VAFB EOD Range

Igniter Rocket Motor
Igniter Retrorocket
Squib Blasting Cap
Adapter
Explosive Bolt
Initiator Dual Bridgewire
Gas Generator
Bidirectional Destruct Charge
Battery
Explosive Transfer Assembly
Detonating Fuse
Valve Assembly Explosive
0.62-millimeter (mm) Cartridge
Launcher Assembly
0.5-lb TNT
Fire Extinguisher Cartridge
Demolition Charge
Aircraft Cartridge
0.38-mm Cartridge
Bomarc "A" Trigger Assembly
40-mm Cartridge
5.56-mm Cartridge
7.62-mm Cartridge
Percussion Primer
45-caliber (cal.) Cartridge
Auxiliary Explosive Booster

Source: ESE, 1984.

4.2 WASTE DISPOSAL METHODS AND DISPOSAL SITES IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

4.2.1 LANDFILLS

Twelve landfills that were used for either sanitary or debris disposal were identified at VAFB. Landfill locations are identified on Fig. 4.2-1, and a summary of important landfill details has been presented in Table 4.2-1.

Landfill No. 1 (LF-1)

LF-1 is located in the central section of the installation, directly north of LF-2, adjacent to DPDO and CES. The landfill, which is approximately 10 acres in size, was operated between 1942 and 1957. Fill material consisted of incinerator ash, unburnable slag, scrap metal, pesticides, waste POL, and UXO. Inspection of the LF-1 site showed a number of parallel ridges that resulted from the area/surface fill operation. Currently, LF-1 is completely closed, with an adequate soil cover. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 2 (LF-2)

LF-2 is located in the central section of the base, immediately south of the Utah Ave. and Pine Canyon Rd. intersection. LF-2 is approximately 140 acres in size and is situated in a natural canyon. The site was initially used for disposal in approximately 1941 and is currently the sanitary landfill for the base. Fill material consists of sanitary trash, miscellaneous waste POL, waste solvents, pesticides, transformer oil, ordnance, paint, scrap missile material, scrap metal, PCB-contaminated soil, and construction debris. Currently, LF-2 is operated as an area fill, with daily soil cover.

Surface runoff from the cantonment area is diverted to the perimeter of LF-2 along the canyon walls by open culverts and drain pipes.

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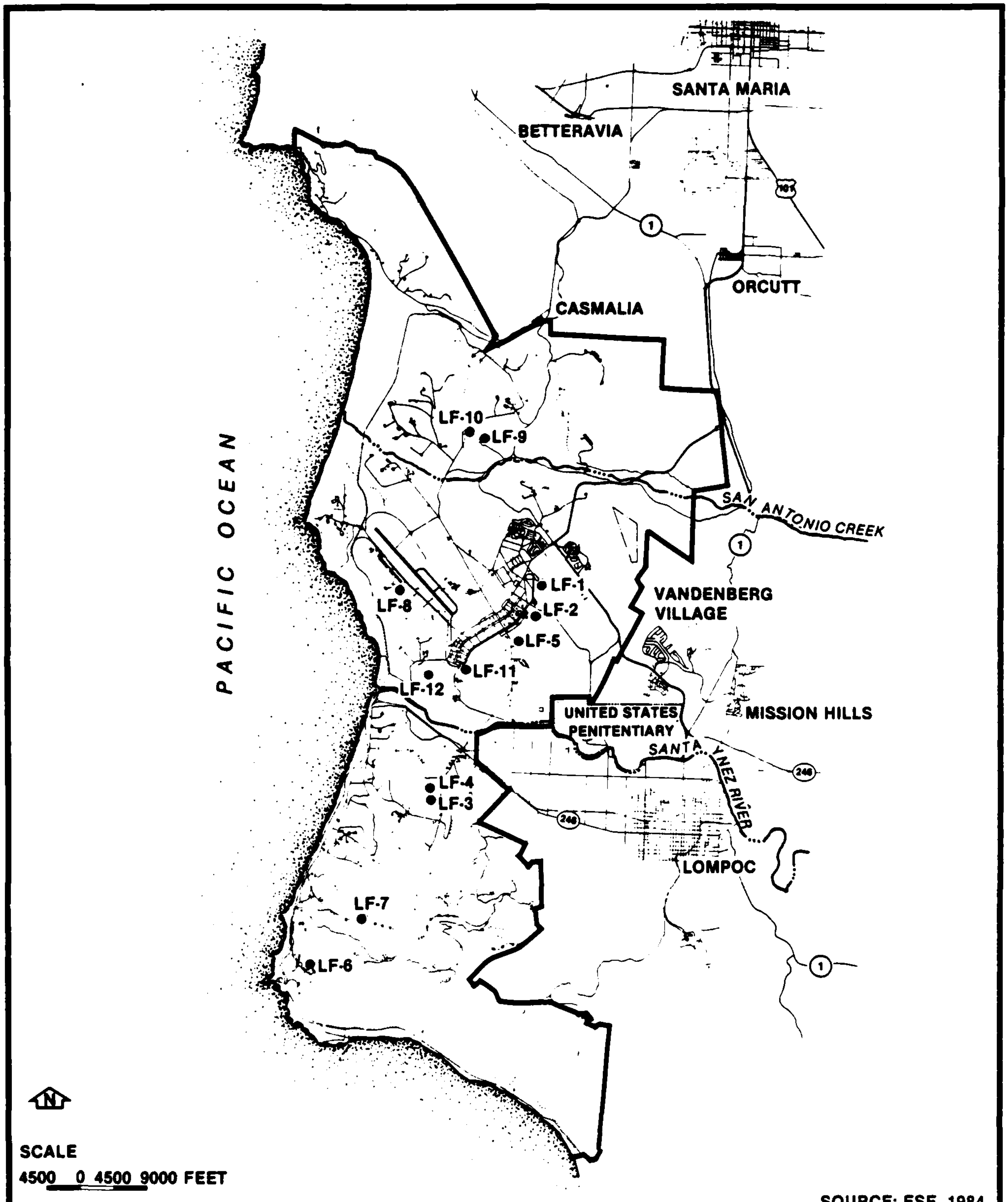

SOURCE: ESE, 1984.

Figure 4.2-1 LOCATIONS OF LANDFILLS	INSTALLATION RESTORATION PROGRAM Vandenberg Air Force Base

Table 4.2-1. Descriptions of Landfills on VAFB

Landfill No.	Date of Operation	Approximate Size (acres)	Type of Waste	Method of Operation	Closure Status
LF-1	1942-1957	10	Incinerator ash, slag, scrap metal, waste POL, ordnance, pesticides	Surface/ area fill	Closed, soil cover
LF-2	1941?-Present	140	Sanitary fill, Bomarc missile scrap, waste POL, pesticides, solvents, transformer oil, scrap metal and concrete debris, ordnance, paint, PCB-contaminated soil	Area fill in natural canyon	Currently operated
LF-3, LF-4	1959-1962	10, 5	Sanitary fill, waste POL, construction debris, pesticides	Area fill	Closed, soil cover
LF-5	1944-1959	30	Sanitary fill, construction debris, scrap metal, POL	Area fill	Closed, soil cover
LF-6	1965-Present	5-10	Construction debris	Area/surface fill	Currently operated
LF-7	Mid-1950s	5-10	Sanitary fill (residential)	Area fill	Closed
LF-8	1961-1966(?)	6-10	Waste POL, ordnance, construction debris	Area fill	Closed, soil cover
LF-9	1950-1958	2	Sanitary fill (residential)	Area fill	Closed, soil cover
LF-10	1950s	2	Sanitary fill (residential)	Area fill	Closed, soil cover
LF-11	Mid-1940s-Late 1950s	5	Incinerator ash, slag, waste oil, solvents	Surface fill/dump	Closed, soil cover, revegetated
LF-12	1982-Present	3	Construction debris	Area fill	Currently operated

Source: ESE, 1984.

Leachate generated in the filled, upper section of the canyon migrates downgradient to a leachate retention pond. Additionally, a drainage sump is located farther downgradient to collect leachate that bypasses the retention pond. From this sump, leachate is pumped back to the retention pond and then pumped to the top of the canyon, where it is surficially sprayed. Field inspection of the leachate collection system and the downgradient canyon area revealed leachate moving past the collection sump and flowing down the canyon. Leachate migration down Oak Canyon may pose a potential threat to the Santa Ynez aquifer system, which serves as the potable water supply for Lompoc and VAFB. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfills No. 3 and No. 4 (LF-3 and LF-4)

LF-3 and LF-4 are located in South VAFB, off Mesa Rd. and immediately northeast of SLC-3W. LF-3 and LF-4 are approximately 10 and 5 acres in size, respectively. These landfills were operated between 1958 and 1964 for disposal of sanitary trash, waste POL (unknown quantity), pesticides, and construction debris. LF-3 and LF-4 were operated as area fills. No burning was conducted at either site. Currently, the area is covered with soil, although some fill is visible on the surface. The proximity of LF-3 and LF-4 to South Vandenberg Wells No. 1 and No. 3 poses a potential for potable supply contamination. LF-3 and LF-4 are located over the Lompoc Terrace Aquifer. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 5 (LF-5)

LF-5 is located south of LF-2, off 13th St., near Bldg. 6710. LF-5 is approximately 30 acres in size and is located on a branch of Oak Canyon, with drainage to the Santa Ynez River. From 1944 to 1959, LF-5 was used for disposal of sanitary trash, construction debris, and some scrap

metal. It is not known whether waste oils or liquids were disposed of in LF-5; however, waste disposal practices during the period of operation would indicate the disposal of some waste POL and solvents at this location. Burning operations were not conducted at this site. LF-5 was operated as an area fill. Currently, LF-5 is covered with soil and revegetated. The site does have some potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 6 (LF-6)

LF-6 is located in South VAFB, at SLC-6. This landfill is approximately 5 to 10 acres in size and has been operated since 1965 for disposal of construction debris generated by the Manned Orbiting Laboratory program and currently by the Space Shuttle program. LF-6 poses no potential contamination or hazardous leachate formation. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 7 (LF-7)

LF-7 is located in South VAFB, along Honda Canyon Rd. and east of SLC-5. This landfill is approximately 5 to 10 acres in size and was operated in the mid-1950s for disposal of residential sanitary trash generated by local ranches. LF-7 is closed and has no potential for contamination or hazardous leachate formation. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 8 (LF-8)

LF-8 is located in the central section of VAFB, west of the runway near Bldgs. 1049 and 1051. The landfill is approximately 6 to 10 acres in size and was operated between 1961 and 1966 for disposal of construction debris, waste POL (unknown quantity), and UXO. LF-8 was operated as an area fill, with no burning at the site. Currently, the landfill is closed, covered with soil, and partially revegetated. The

location of LF-8 on VAFB poses minimal potential for contamination and migration of hazardous leachate. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 9 (LF-9)

LF-9 is located in the northern section of VAFB, off KOA Rd., in the vicinity of the base golf course. LF-9, which is approximately 2 acres in size, was operated between 1950 and 1958. Fill material consisted of sanitary trash from small, residential areas on the northern section of the base. LF-9 was operated as an area fill and is currently closed, with an adequate soil cover. LF-9 has minimal or no potential for contamination or hazardous leachate formation. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 10 (LF-10)

LF-10 is located in the vicinity of LF-9, along El Rancho Rd. This landfill was operated during the 1950s and is about 2 acres in size. LF-10 is similar to LF-9 in type of waste disposed and method of operation. LF-10 is currently closed and poses minimal or no potential for contamination or hazardous leachate formation. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 11 (LF-11)

LF-11 is located in the central section of VAFB, near the intersection of Utah Ave. and Tenna Rd., north of Bldg. 1180. This landfill is is approximately 5 acres in size and was operated during the mid-1940s to the late 1950s. LF-11 received ash and unburnable slag from a nearby 10-ton incinerator, in addition to unknown quantities of waste POL and solvents. Field inspection of this site revealed no surficial evidence of the landfill, although metal debris was visible throughout the gully below the site. This site does have potential for contamination and

potential exists for the migration of metals, organics, pesticides, and PCBs. This site received a HARM score of 78.

Chemical Disposal Site No. 6 (CS-6)

Space Launch Complex No. 3 (SLC-3) is the site of CS-6. This disposal site consists of lined treatment lagoons at SLC-3W and SLC-3E in which small quantities of fuel are neutralized and, along with deluge water, discharged to grade. Discharges occur when a missile is launched, during missile checkout procedures, and when rain water is collected in the lagoon. A total of 18 discharges occurred in 1983. BES has collected samples from monitor wells installed in this area and is currently collecting data as part of a monitoring program. The potential exists at this site for the migration of metals and organics. This site received a HARM score of 74.

Chemical Disposal Site No. 7 (CS-7)

CS-7 is located at SLC-4E and SLC-4W and consists of neutralization ponds which discharge to grade. Discharges occur when a missile is launched (approximately twice per year at the east and west launch sites), when rain water collects in the pond, and during missile checkout procedures. Thirty-five discharges occurred in 1983. Monitor wells have been established at this site, and data on the composition of the discharge water and quality of the ground water are being collected as part of a program conducted by BES. The potential exists for contamination by metals and organics. This site received a HARM score of 74.

Chemical Disposal Site No. 4 (CS-4)

CS-4 is located at the Titan Tank Farm (Bldgs. 6830-6836). Waste disposal at this site consists of the neutralization and discharge to grade of small quantities of Aerozine 50. Monitor wells have been installed at this site, and data are being collected as part of a BES program. The potential exists at this site for contamination by organics. This site received a HARM score of 73.

Table 5.0-1. Priority HARM Ranking of Potential Contamination Sources on VAFB

Rank	Site	Designation	Date of Operation or Occurrence	HARM Score
1	Landfill No. 2	LF-2	1941 - Present	78
2	Chemical Disposal Site No. 6	CS-6	1962 - Present	74
3	Chemical Disposal Site No. 7	CS-7	1962 - Present	74
4	Chemical Disposal Site No. 4	CS-4	1963 - Present	73
5	Chemical Disposal Site No. 5	CS-5	1961 - Present	72
6	Chemical Disposal Site No. 3	CS-3	1960 - 1982	71
7	Landfills No. 3 and 4	LF-3/LF-4	1959 - 1964	59
8	Chemical Disposal Site No. 8	CS-8	1959 - 1964	58
9	Landfill No. 1	LF-1	1944 - 1959	56
10	Firefighter Training Area No. 1	FTA-1	1942 - Present	53
11	Drum Disposal Site No. 1	DDS-1	1957	50
12	Landfill No. 11	LF-11	1940s - Late 1950s	47
13	Landfill No. 5	LF-5	1944 - 1959	46
14	Chemical Disposal Site No. 2	CS-2	1942 - 1959	46
15	Chemical Disposal Site No. 1	CS-1	1962 - Present	45
16	Chemical Disposal Site No. 9	CS-9	1958 - 1984	44
17	Abandoned Underground Tank Area	AUTA	1941 - Early 1960s	41

Source: ESE, 1984.

5.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government employees. The potential contamination sources identified at VAFB and the HARM scores for those sites are listed in Table 5.0-1. Evaluations and conclusions regarding each ranked site are summarized in the following paragraphs.

Landfill No. 2 (LF-2)

LF-2 is the current base landfill. LF-2 has been in operation since 1941. Items disposed of in this landfill include sanitary trash, waste POL, pesticides, transformer oil, paint, paint thinner, PCB-contaminated soil, missile components, and construction materials. LF-2 is located at the head of Oak Canyon, bounded on the north by Pine Canyon Rd. and on the west by Utah Ave.

At this site several monitor wells have been installed, and ground water analysis has shown the presence of priority pollutants (e.g., TCE, benzene). A leachate collection system has been installed at the foot of the landfill in an attempt to stop the migration of any contaminated waters. The ground water flow from this site is toward the south. Monitor wells have been installed in the canyon south of the site. Some of these wells may not be installed or screened to the proper depth to intercept the flow of leachate-contaminated ground water. The soils in this area favor the migration of contaminants. The migration of contaminants would be toward the Santa Ynez Aquifer, which is used as the potable water source for both VAFB and the town of Lompoc. The

Table 4.2-4. Summary of HARM Scores for Potential Contamination Sources on VAFB

Rank	Site	Designation	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Landfill No. 2	LF-2	47	100	100	0.95	78
2	Chemical Disposal Site No. 6	CS-6	53	80	100	0.95	74
3	Chemical Disposal Site No. 7	CS-7	55	80	100	0.95	74
4	Chemical Disposal Site No. 4	CS-4	52	100	100	0.95	73
5	Chemical Disposal Site No. 5	CS-5	48	80	100	0.95	72
6	Chemical Disposal Site No. 3	CS-3	53	60	100	1.0	71
7	Landfills No. 3 and 4	LF-3/LF-4	52	100	35	0.95	59
8	Chemical Disposal Site No. 8	CS-8	65	60	57	0.95	58
9	Landfill No. 1	LF-1	42	100	35	0.95	56
10	Firefighter Training Area No. 1	FTA-1	32	100	28	1.00	53
11	Drum Disposal Site No. 1	DDS-1	42	80	35	0.95	50
12	Landfill No. 11	LF-11	39	60	50	0.95	47
13	Landfill No. 5	LF-5	45	60	43	0.95	46
14	Chemical Disposal Site No. 2	CS-2	39	50	50	0.95	46
15	Chemical Disposal Site No. 1	CS-1	43	60	33	1.0	45
16	Chemical Disposal Site No. 9	CS-9	57	48	28	1.0	44
17	Abandoned Underground Tank Area	AUTA	49	40	35	1.0	41

Source: ESE, 1984.

All sites identified in Table 4.2-3 as having a potential for contamination and contaminant migration were evaluated using the HARM system. The HARM system includes consideration of potential receptor characteristics, waste characteristics, pathways for migration, and specific site characteristics related to waste management practices. The details of the rating procedure are presented in App. G; results of the assessment are summarized in Table 4.2-4.

The HARM system is designed to indicate the relative need for remedial action. The information presented in Table 4.2-4 is intended for assigning priorities for further evaluation of the VAFB disposal areas (Sec. 5.0--Conclusions and Sec. 6.0--Recommendations). The rating forms for the individual waste disposal sites at VAFB are presented in App. H. Photographs of some of the key disposal sites are included in App. F.

Table 4.2-3. Summary of Decision Process Logic for Areas of Initial Environmental Concern at VAFB* (Continued, Page 2 of 2)

Site	Designation	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern†	Refer to Base Environmental Programs	HARM Rating
Firefighter Training Area No. 1	FTA-1	Yes	Yes	No	N/A	Yes
Bomarc Burial Site No. 1	BB-1	Yes	No	No	No	No
Bomarc Burial Site No. 2	BB-2	Yes	No	No	No	No
Abandoned Underground Tank Area	AUTA	Yes	Yes	No	No	Yes

*Refer to Fig. 1.3-1 for the decision process.
†Other environmental concerns include environmental problems that are not within the scope of this study (e.g., air pollution, occupational safety problems).
**N/A = Not applicable.

Source: ESE, 1984.

Table 4.2-3. Summary of Decision Process Logic for Areas of Initial Environmental Concern at VAFB*

Site	Designation	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern†	Refer to Base Environmental Programs	HARM Rating
Landfill No. 1	LF-1	Yes	Yes	No	N/A**	Yes
Landfill No. 2	LF-2	Yes	Yes	No	N/A	Yes
Landfill No. 3	LF-3	Yes	Yes	No	N/A	Yes
Landfill No. 4	LF-4	Yes	Yes	No	N/A	Yes
Landfill No. 5	LF-5	Yes	Yes	No	N/A	Yes
Landfill No. 6	LF-6	No	No	No	N/A	No
Landfill No. 7	LF-7	No	No	No	No	No
Landfill No. 8	LF-8	No	No	No	No	No
Landfill No. 9	LF-9	No	No	No	No	No
Landfill No. 10	LF-10	No	No	No	No	No
Landfill No. 11	LF-11	Yes	Yes	No	N/A	Yes
Landfill No. 12	LF-12	No	No	No	No	No
Drum Disposal Site No. 1	DDS-1	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 1	CS-1	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 2	CS-2	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 3	CS-3	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 4	CS-4	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 5	CS-5	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 6	CS-6	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 7	CS-7	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 8	CS-8	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 9	CS-9	Yes	Yes	No	N/A	Yes
Fuel Spill Site No. 1	FS-1	No	No	No	No	No
Fuel Spill Site No. 2	FS-2	No	No	No	No	No
Fuel Spill Site No. 3	FS-3	No	No	No	No	No
Hazardous Waste Storage Site No. 1	HWS-1	Yes	No	No	No	No

limited primarily to the cantonment area (see photograph in App. F) where refueling and minor maintenance routinely took place. Records searched did not indicate any reportable spills at VAFB.

4.2.4 FIREFIGHTER TRAINING AREA

Firefighter training at VAFB is currently conducted at the firefighter training area (FTA-1) located at the northwest corner of Tangair Rd. and Mira Rd. The site consists of a mock aircraft and a smokehouse; the aircraft is within a large, circular berm. The area has a drain which is connected to an oil/water separator; however, no continuous liner underlies the training area. This training area operation has been used approximately 40 to 60 times per year since it began operation. A typical training session consumes 500 to 600 gal of JP-4. The training area was constructed in 1958 and has been in continuous use since then. No other training areas were identified on VAFB. Because the firefighter training area has potential for contamination and contaminant migration, this site has been ranked using the HARM process (see App. H).

4.2.5 HAZARD ASSESSMENT EVALUATION

The review of past operation and maintenance functions and past waste management practices at VAFB has resulted in the identification of sites that were initially considered areas of concern, with potential for contamination and migration of contaminants. These sites, described in Secs. 4.2.1, 4.2.2, 4.2.3, and 4.2.4, were evaluated using the decision process presented in Fig. 1.3-1 (in Sec. 1.3). Sites which were found to have no potential for contamination were deleted from further consideration. Sites which were found to have potential for contamination and migration of contaminants were further evaluated using the HARM system. The decision process logic used for each area of initial concern is presented in Table 4.2-3. Twelve of the 30 disposal sites were found to have no potential for contamination or contaminant migration. The remaining 18 disposal sites (LF-1, LF-2, LF-3, LF-4, LF-5, LF-11, CS-1, CS-2, CS-3, CS-4, CS-5, CS-6, CS-7, CS-8, CS-9, DDS-1, AUTA, and FTA-1) were further evaluated using the HARM system. Specific recommendations for each site are described in Sec. 6.0.

Chemical Disposal Site No. 6 (CS-6)
Space Launch Complex No. 3 (SLC-3) is the location of CS-6. This disposal site consists of a lined treatment lagoon where small quantities of fuels are neutralized and, along with deluge water, are discharged to grade. BES has a program to characterize the wastes and monitor the ground water at this site. Three wells have been installed at this site as part of a monitoring program established by BES.

Chemical Disposal Site No. 7 (CS-7)
CS-7 is located at SLC-4. This disposal area is located where neutralized fuels are discharged to grade from a lagoon. Two monitoring wells have been installed at this site. BES is currently monitoring the wells at this site.

Chemical Disposal Site No. 8 (CS-8)
This disposal area is a stormwater drainage ditch located to the south of Bldg. 836. This area was used as a disposal site for waste oils and solvents during the years the Navy operated the Point Arguello Naval Missile Facility (1958 to 1964). Quantities of waste oil and solvents disposed of in this area were not available.

Chemical Disposal Site No. 9 (CS-9)
This disposal area is located adjacent to the neutralization pond and flame bucket at SLC-2. The neutralization pond contained dilute fuels and solvents (e.g., TCE). Dilute fuels were neutralized and discharged to grade during the years of operation of the site (1958 to 1984). No monitor wells have been installed at this site.

4.2.3 FUEL SPILL SITES
A majority of the POL used and stored at VAFB are MOGAS, DF-2, and JP-4. Due to the nature of operations at VAFB, minor fuel losses occur during transfer and bulk loading. Minor spills may have been common during the Camp Cooke era, when large numbers of motorized vehicles were used extensively for training purposes. This spillage is suspected to be

Reportedly, waste oils and solvents generated by oil-changing and parts-cleaning operations were dumped in this area. Quantities of oil and solvents disposed of in this area are unknown. The heaviest use of this area probably occurred between the years of 1941 and 1945. The last disposal operations were conducted in this area in the late 1950s.

Chemical Disposal Site No. 3 (CS-3)

CS-3, located to the south of the Advanced Ballistics Reentry System (ABRES) "A" site, consists of a neutralization lagoon, the contents of which were periodically discharged to grade and entered a lake. The contents of the lagoon may have included TCE and other fuels and solvents. The ABRES "A" site was in use from 1961 to 1982. Quantities of TCE and other fuels and solvents discharged to the neutralization lagoon are unknown. It is unknown if detectable quantities of contaminants are present in the lake.

Chemical Disposal Site No. 4 (CS-4)

The Titan Tank Farm (Bldgs. 6830-6836) is the location of CS-4. Wastes disposed of at this site include neutralization products of Aerozine 50. Neutralization of the fuels occurs in a lined lagoon, and the wastewater is disposed of to grade.

BES has conducted some controlled studies of the neutralization ponds that indicate the presence of trace levels of TCE and other chemicals. No monitoring wells have been installed in the area to determine the ground water quality.

Chemical Disposal Site No. 5 (CS-5)

CS-5 is located at the Agena Tank Farm area (Bldgs. 1180-1196). This disposal site, like CS-4, consists of the area where neutralized fuels and contaminants are discharged to grade after treatment in a lined pond. Chemicals neutralized at this site include UDMH, MMH, and IRFNA.

Table 4.2-2. Summary of Information on VAFB Chemical Disposal Sites (Continued, Page 2 of 2)

Site Description	Designation	Dates of Operation	Waste Description
Chemical Disposal Site No. 7 (SLC-4 for Titan Missiles)	CS-7	1965-present	UDMH and other solvents which are contaminants in the neutralization pond; TCE used to wash out fuel lines
Chemical Disposal Site No. 8 (Bldg. 836)	CS-8	1958-1964	Waste oils and solvents
Chemical Disposal Site No. 9 (SLC-2)	CS-9	1958-1984	Hydrazine, nitrogen tetroxide, isopropyl alcohol, and Freon® 113

Source: ESE, 1984.

Table 4.2-2. Summary of Information on VAFB Chemical Disposal Sites

Site Description	Designation	Dates of Operation	Waste Description
Chemical Disposal Site No. 1	CS-1	1965-present	Pesticides, including DDT and other persistent compounds
Chemical Disposal Site No. 2	CS-2	1941-late 1950s (heavy use 1941-1945)	Waste oils and chlorinated solvents
Chemical Disposal Site No. 3 (ABRES "A" Site)	CS-3	1960-1982	TCE, other solvents and fuels
Chemical Disposal Site No. 4 (Titan Tank Farm)	CS-4	1963-present	Chemical artifacts from the neutralization of nitrogen tetroxide, Aerozine 50, and solvents
Chemical Disposal Site No. 5 (Agena Tank Farm)	CS-5	1961-present	Chemical artifacts from the neutralization of IRFNA, UDMH, MMH, nitrogen tetroxide, and solvents
Chemical Disposal Site No. 6 (SLC-3 for Atlas Missiles)	CS-6	1965-present	Kerosene fuel and other chlorinated solvents which are contaminants in the lined treatment lagoons at the E and W complexes; TCE used to wash out fuel lines

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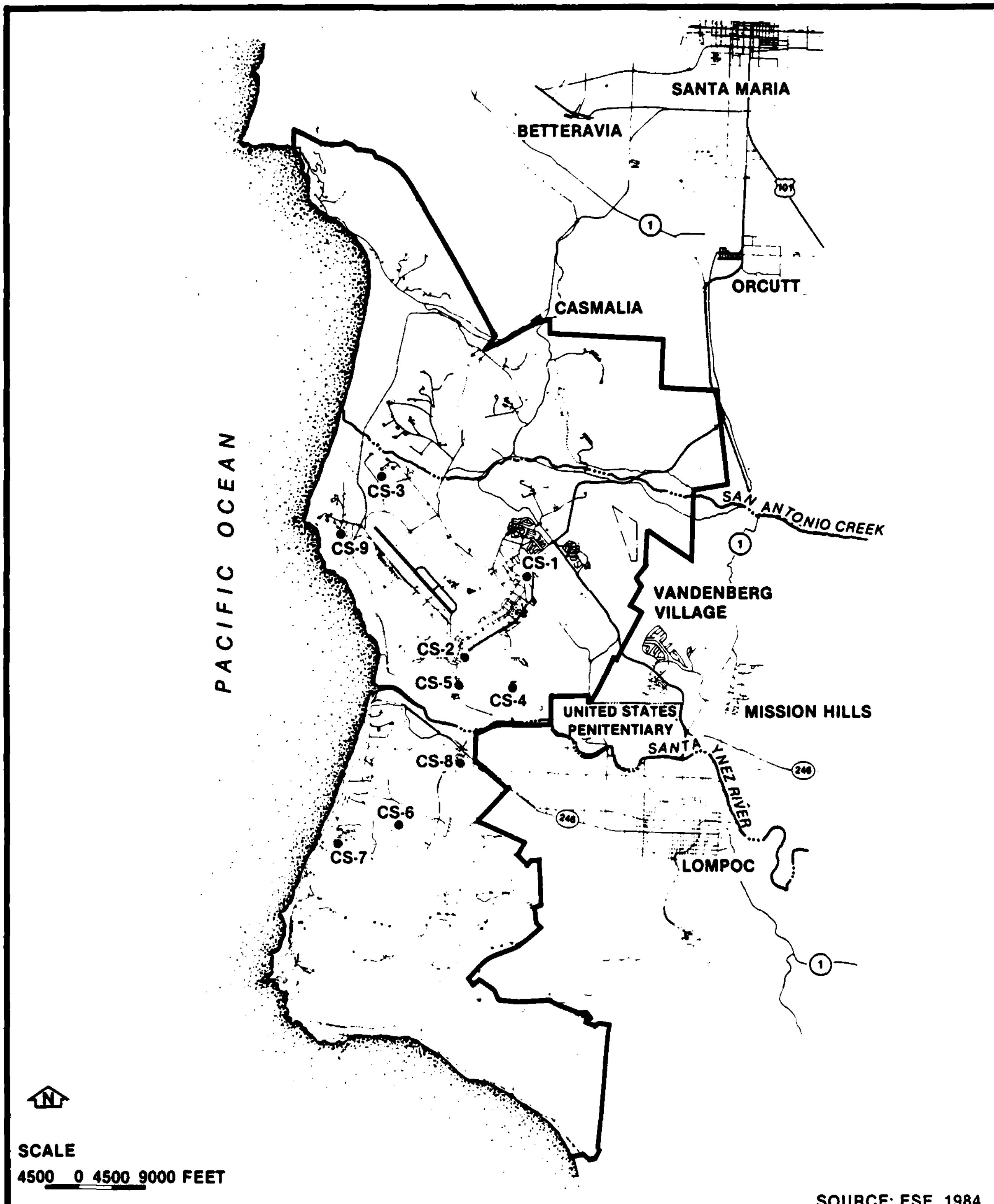

Figure 4.2-2
LOCATIONS OF CHEMICAL DISPOSAL SITES

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 12 (LF-12)

LF-12 is located in the central section of VAFB, near the intersection of 35th St. and Beach Blvd. This landfill is approximately 3 acres in size and has been operated since 1982. Filling occurs in a small borrow pit, with disposal of construction debris such as concrete and asphalt. LF-12 poses no potential contamination or hazardous leachate formation. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

4.2.2 CHEMICAL DISPOSAL SITES

Nine chemical disposal sites were identified on VAFB; their locations are shown in Fig. 4.2-2, and designations used in this report, dates of operation, waste descriptions, and other information are summarized in Table 4.2-2.

Chemical Disposal Site No. 1 (CS-1)

The washrack area adjacent to Bldg. 11347 was used from 1965 through 1982 for mixing pesticides and washing and rinsing pesticides-spraying equipment during cleanup operations. Rinsewaters and excess pesticide formulations were disposed of on the soil adjacent to the washrack pad and also down the washrack drain to the stormwater drainage system. Until 1974, large quantities of DDT were reportedly used at VAFB. DDT residues, in addition to residues from other persistent-type pesticides (e.g., chlordane, toxaphene), may still remain in the soils around the washrack pad.

Chemical Disposal Site No. 2 (CS-2)

CS-2 was located on or directly adjacent to LF-11. This area was adjacent to the Camp Cooke motorpool areas, where combat tanks and other equipment (e.g., jeeps, trucks) were stored, maintained, and repaired by the various Army heavy armor companies.

Chemical Disposal Site No. 5 (CS-5)

CS-5 is located at the Agena Tank Farm and consists of a neutralization lagoon which discharges to grade. Potential contaminants at this site are UDMH, MMH, hydrazine, and IRFNA. Monitor wells have been installed at this site, and data are being collected as part of a BES program. The potential exists at this site for contamination by organics. This site received a HARM score of 72.

Chemical Disposal Site No. 3 (CS-3)

This disposal site is located at the former ABRES "A" complex and consists of a neutralization pond which discharged to grade. In addition to fuels, this site received small quantities of solvents, including TCE. This site was used from 1961 to 1982. Drainage from this area enters a lake. The potential exists for contamination of the soils and surface water at this site by organics. This site received a HARM score of 71.

Landfills No. 3 and No. 4 (LF-3 and LF-4)

LF-3 and LF-4 were operated by the Navy on South VAFB from 1958 to 1964. These areas received sanitary trash, waste POL, solvents, pesticides, and construction debris. The soils in this area are permeable and contaminants could migrate. This area overlies the Lompoc Terrace Aquifer, which is used as a source of potable water. Due to their location, LF-3 and LF-4 have been combined for this study. The potential exists for contamination by metals, organics, and pesticides. This site received a HARM score of 59.

Chemical Disposal Site No. 8 (CS-8)

CS-8 is located in the drainage ditch south of Bldg. 836 on South VAFB and was used by the Navy from 1958 to 1964. Contaminants disposed of in this area include waste oils and solvents. The soils in this area are permeable, and the area overlies the Lompoc Terrace Aquifer, which is used as a potable water source. The potential exists for contamination by metals and organics at this site. CS-8 received a HARM score of 58.

Landfill No. 1 (LF-1)

LF-1 is located in the central section of VAFB, immediately east of Utah Ave. This area was used from 1942 to 1957. Wastes disposed of in this area included incinerator slag, waste POL, sanitary trash, scrap metal, solvents, pesticides, and construction debris. The soils in this area are permeable, and infiltration of contaminants is possible. No leachate seeps were noted during the site visit. The potential exists for contamination by metals, organics, and pesticides. This site received a HARM score of 56.

Firefighter Training Area No. 1 (FTA-1)

FTA-1 is located near the southeastern end of the VAFB runway, along Tangair Rd. This area has existed since 1942, and large quantities of waste POL, fuels, and solvents have been used at this site. The soils in this area are permeable, and infiltration can occur. The potential exists for contamination by metals and organics at this site. This site received a HARM score of 53.

Drum Disposal Site No.1 (DDS-1)

DDS-1 is located in the area immediately outside the northern perimeter fence of the current DPDO area. This area was used for the one-time disposal of approximately 50 drums of waste POL and solvents. A trench was dug and the items were buried in 1957. This burial is in the area immediately south of LF-1 and east of Utah Ave. The soils in this area are permeable, and migration can occur. The drums buried at this site may still be intact. The potential exists for contamination by metals and organics. This site received a HARM score of 50.

Landfill No. 11 (LF-11)

LF-11 is located at the southeastern end of the VAFB cantonment area, immediately east of the area where Army tank maintenance areas were located in 1942 to 1945. This landfill received ash and slag from a nearby 10-ton incinerator in addition to scrap metal, waste POL, and degreasing solvents. No leachate formation was noted during the onsite

visit. The soils in this area are permeable and conducive to migration. Limited potential exists for migration from this site. This site received a HARM score of 47.

Landfill No. 5 (LF-5)

LF-5 is located south of 13th St., near Bldg. 6710. This area was used from 1944 to 1959 and received sanitary trash, construction debris, and some scrap metal. Although the soils in this area are permeable, little contaminant migration is expected due to the small quantities of potential contaminants at this site. This site received a HARM score of 46.

Chemical Disposal Site No. 2 (CS-2)

CS-2 is located on or adjacent to LF-11 on the southeastern corner of the VAFB cantonment area. This area received waste oils and solvents from the maintenance shops operated by the Army tank units during 1941 to 1945. Although the soils in this area are permeable, little contaminant migration is expected due to the small quantities of waste materials. This site could not be located during the onsite visit. This site received a HARM score of 46.

Chemical Disposal Site No. 1 (CS-1)

CS-1 is the location of the pesticide mixing, rinsing, and storage area at a washrack adjacent to Bldg. 11347. This area has been used since 1965. Although soils in this area are permeable, little migration is expected due to the quantities of material which were disposed of on the ground. This site received a HARM score of 45.

Chemical Disposal Site No. 9 (CS-9)

CS-9 is located adjacent to the neutralization lagoon at SLC-2. This area received small quantities of waste fuels and solvents (e.g., TCE), which were discharged to grade after neutralization. Although the soils in this area are permeable, little migration is expected due to the small quantities of materials disposed of. This site received a HARM score of 44.

Abandoned Underground Tank Area (AUTA)

AUTA is located in areas designated 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13 on the Camp Cooke site plan (Camp Cooke, 1951). This area is also shown on Fig. 4.1-1. These contiguous areas, located in the cantonment area of VAFB, contain approximately 500 abandoned underground tanks. The soils under this area are conducive to migration. The tanks may contain POL and, if leaking, migration would occur. This site received a HARM score of 41.

6.0 RECOMMENDATIONS

Fifteen sites were identified at VAFB as having potential for environmental contamination and have been evaluated using the HARM system. The relative potential of the sites for environmental contamination was assessed, and sites which may require further study and monitoring were identified. Sites of primary concern are those with higher HARM scores which have a higher potential for environmental contamination and should be investigated in Phase II. Some of the sites that require Phase II monitoring are already included in an ongoing environmental monitoring program conducted by BES on VAFB. It is recommended that ongoing monitoring programs be continued. Sites of secondary concern are those with lower HARM scores and moderate potential for environmental contamination. Further study at these sites is recommended, but the need for investigation is less than for the sites with higher rankings. The latter investigations may be performed as part of the VAFB environmental program.

6.1 PHASE II MONITORING RECOMMENDATIONS

The following actions are recommended to further assess the potential for environmental contamination from waste disposal areas at VAFB. The recommended actions are intended to be used as a guide in the development and implementation of the Phase II study. The recommendations include the approximate number of ground water monitoring wells, type(s) of samples to be collected (e.g., soil, water, sediment), and suspected contaminants for which analyses should be performed. The number of ground water monitoring wells recommended corresponds to the number of wells required to adequately determine whether contaminants are migrating from a given source. The final number of ground water monitoring wells required to determine the extent of and define the movement of contaminants from each site will be determined as part of the Phase II investigation. Geophysical methods for identifying the extent of some landfills and the locations of burial areas are recommended.

Recommended ground water monitoring should be performed on a quarterly basis for 1 year in order to assess contaminant migration under different precipitation regimes. All monitoring data should be evaluated throughout the program to determine the need for further action (if any).

All monitor wells should be constructed of 2-inch or 4-inch polyvinyl chloride (PVC) threaded-joint casing and factory-slotted screen. Due to various solvents in PVC glue, threaded-joint casing is recommended to prevent analytical artifacts. The wells should be installed at varying depths, depending on the site. The screen should extend over no more than approximately 20 ft of the saturated interval and approximately 5 ft above the water table, or 1 ft above the highest water table. The wells need to be screened above the water table to detect nonmiscible, floating contaminants, such as petroleum products. A detailed log of the well boring should be made, including well construction diagrams prepared by a registered geologist. Shelby tube samples collected during drilling should be tested to determine vertical permeability. The annulus surrounding the screen should be filled with a filter pack material of medium-fine sand. The top of the filter pack should be bentonite-sealed, and the annulus should be grouted to the surface. The well should be protected with pipe fitted with locking caps. The well should be developed to the fullest extent possible and surveyed both vertically and horizontally by a registered surveyor to obtain accurate well location distances and water level elevations. Water levels should be measured after well development and at the time of sampling.

The recommended environmental monitoring program for the 15 sites is summarized in Table 6.1-1. The detailed approaches for the sites are described in this section. The set of parameter lists presented in Table 6.1-2 is keyed to the sample types and locations summarized in Table 6.1-1.

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations

Site	Designation	HARM Score	Recommended Monitoring	Remarks
1. Landfill No. 2	LF-2	78	Monitor wells are currently in place upgradient and downgradient of the landfill. These wells are monitored as part of an existing monitoring program developed by by BES. As part of the Phase II investigation, the following additions to the program are recommended: (a) redrill Well 13 and screen from 5 to 65 ft; (b) install one additional downgradient well between existing Wells 12 and 13; and (c) sample and analyze the new wells and existing wells around LF-2 for the parameters in List A, Table 6.1-2.	If sampling indicates contamination is migrating down the canyon in the ground water, additional wells may be necessary to quantify the extent.
2. Chemical Disposal Site No. 6	CS-6	74	The BES currently has a monitoring program for this site. This program should be continued.	

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations (Continued, Page 2 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
3. Chemical Disposal Site No. 7	CS-7	74	The BES currently has a monitoring program for this site. This program should be continued.	
4. Chemical Disposal Site No. 4	CS-4	73	The BES currently has a monitoring program for this site. This program should be continued.	
5. Chemical Disposal Site No. 5	CS-5	72	The BES currently has a monitoring program for this site. This program should be continued.	
6. Chemical Disposal Site No. 3	CS-3	71	Sample and analyze the lake into which discharges were formerly directed. The samples should be analyzed for the parameters in List A, Table 6.1-2.	

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations (Continued, Page 3 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
7. Landfills No. 3 and No. 4	LF-3/LF-4	59	Install one upgradient and two downgradient monitor wells. Sample and analyze these wells for the parameters in Lists B, C, and D, Table 6.1-2.	If sampling confirms contamination, additional wells may be required to quantify the extent. Ground water flow direction in this area is assumed to be north-northeast.
8. Chemical Disposal Site No. 8	CS-8	58	Collect three soil samples in the drainage ditch in areas where the waste oil/solvents were disposed. Collect one background sample in the ditch upgradient of the disposal area. Samples should be collected to depths up to 12 inches and should be analyzed for the items in Lists B and E, Table 6.1-2.	If sampling indicates contamination, removal of the soil and disposal as a hazardous waste may be required.
9. Landfill No. 1	LF-1	56	Perform a geophysical survey using electromagnetic and/or magnetometer techniques to determine the areal extent of the landfill and to assure that monitor wells are located outside the landfill area. Install one upgradient and three downgradient monitor wells. Sample and analyze the ground water for the parameters in Lists B, C, and D, Table 6.1-2.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to determine extent of contamination. Ground water flow direction at LF-1 is assumed to be east-southeast.

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations (Continued, Page 4 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
10. Firefighter Training Area No. 1	FTA-1	53	Install one upgradient and two downgradient monitor wells. Sample and analyze the ground water for the parameters in Lists B and C, Table 6.1-2.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to determine the extent of contamination. Ground water flow direction at FTA-1 is assumed to be southwest-northwest.
11. Drum Disposal Site No. 1	DDS-1	50	Perform a geophysical survey using electromagnetic and/or magnetometer techniques to determine the location of the drums. Install one downgradient monitoring well adjacent to DDS-1. Sample and analyze the ground water for the parameters in List B, Table 6.1-2.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to quantify extent of contamination. Ground water flow direction at DDS-1 is assumed to be east.
12. Landfill No. 11	LF-11	47	Survey the area with an OVA to determine if any organic vapors are emanating from the landfill.	If organic vapors are detected, one upgradient and two downgradient wells should be installed and monitored to determine if contamination is present in the ground water. VAFB personnel should periodically check the area for erosion and leachate formation.

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations (Continued, Page 5 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
13. Landfill No. 5	LF-5	46	Survey the area with an OVA to determine if any organic vapors are emanating from the landfill.	If organic vapors are detected, one upgradient and two downgradient wells should be installed and monitored to determine if contamination is present in the ground water. VAFB personnel should periodically check the area for erosion and leachate formation.
14. Chemical Disposal Site No. 2	CS-2	46	Survey the area with an OVA to determine if any organic vapors are emanating from the landfill.	This area is on or adjacent to LF-11. If organic vapors are detected, one upgradient and two downgradient wells should be installed and monitored to determine if contamination is present in the ground water. VAFB personnel should periodically check the area for erosion and leachate formation.
15. Chemical Disposal Site No. 1	CS-1	45	Soil samples may be collected around the washrack area and analyzed for the pesticides included in the EPA priority pollutant list.	If contamination is found, removal and disposal of soils as a hazardous waste may be required.
16. Chemical Disposal Site No. 9	CS-9	44	Install one upgradient and two downgradient monitor wells. Sample and analyze the ground water for the parameters in List A, Table 6.1-2.	Additional wells may be necessary to determine the extent of contamination if contaminants are found.

Table 6.1-1. Summary of Recommended Monitoring for VAFB Phase II Investigations (Continued, Page 6 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
17. Abandoned Underground Tank Area	AUTA	41	Perform a geophysical survey to verify the existence of abandoned tanks at the areas listed in App. J. Using the data obtained in the geophysical survey, select monitor well locations to determine if any contaminants are migrating from potentially leaking tanks. Install one monitor well upgradient and two wells downgradient of the area.	Underground tanks may require removal.

Source: ESE, 1984.

Table 6.1-2. Recommended List of Analytical Parameters for VAFB Phase II Investigations

List A

Priority Pollutants (Selected List)
- Purgeable (Volatile) Organics
- Base Neutral Extractables
- Acid Extractables
- Pesticides/PCBs
- Metals
  - Cadmium
  - Chromium
  - Copper
  - Lead
  - Mercury
  - Arsenic
  - Barium
  - Selenium
  - Silver
- Cyanide

Chloride
Sulfate
Nitrate
Fluoride
pH
Conductivity

List B

Total Organic Halogens
Total Organic Carbon
Phenols
Oil and Grease

List C

Arsenic	Lead	Endrin
Barium	Mercury	Lindane
Cadmium	Nitrate	Methoxychlor
Chromium	Selenium	Toxaphene
Fluoride	Silver	2,4-D
pH		2,4,5-TP
Conductivity		

List D

DDE, DDD, and DDT

List E

Cadmium
Chromium
Copper
Iron
Zinc
Lead
Nickel

Source: ESE, 1984.

It is recommended that chemical analysis for metals include the dissolved fractions only. If the exact metallic constituency of the wastes disposed is unknown, the metals listed under the Interim Primary Drinking Water Standards are recommended for analysis. Because the oil and grease analysis by EPA Method 413.2 (EPA, 1979) does not differentiate between extractables of biological origin or the mineral oils and greases of POL origin, the EPA Infrared (IR) Spectrophotometric Method for total recoverable petroleum hydrocarbons (EPA Method 418.1; EPA, 1979) is recommended for assessing POL contamination. Halogenated and nonhalogenated solvents are amenable to analysis by the gas chromatography/mass spectrometry (GC/MS) purge and trap method for volatile organic hydrocarbons (EPA Method 624). All water samples should be analyzed for pH and conductivity at the time of sampling.

Based on the HARM ranking and the existing VAFB environmental program, 11 of the 15 sites ranked are recommended for Phase II environmental surveys. Five of these 11 sites are currently part of a study program conducted by the VAFB BES. Four of the sites (LF-11, LF-5, CS-2, and CS-1) had the lowest ranking. The recommended studies at LF-11, LF-5, CS-2, and CS-1 are amenable to inclusion in the VAFB environmental program. Detailed recommendations for each site are presented in the following paragraphs.

Landfill No. 2 (LF-2)

The recommended Phase II monitoring for this site should include monitoring of existing wells plus the installation of new wells (see Fig. 6.1-1). Well No. 13, located in the canyon south of LF-2 may not be of sufficient depth nor properly screened to intercept the flow of any contaminated ground water. It is recommended that this well be redrilled to a depth of 65 ft and screened from 5 ft to 65 ft. It is also recommended that an additional well be installed between the current locations of Wells No. 12 and 13. This well should be approximately 65 ft deep and screened from 5 to 65 ft. Samples from these wells and the existing monitor wells should be analyzed for the parameters in List A, Table 6.1-2.

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Table 6.2-2. Descriptions of Guidelines for Land Use Restrictions

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semipermanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food-chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water runon, ponding, and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

Source: ESE, 1984.

Table 6.2-1. Recommended Guidelines for Future Land Use Restrictions at Potential Contamination Sites

Site	Recommended Guidelines for Future Land Use Restrictions											
	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water infiltration (runon, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
Landfill No. 2	R	R	R	NR	NR	R	NA	NA	PU	NR	NA	NA
Chemical Disposal Site No. 6	R	R	R	NR	NR	R	R	NR	PU	NR	NA	NA
Chemical Disposal Site No. 7	R	R	R	NR	NR	R	R	NR	PU	NR	NA	NA
Chemical Disposal Site No. 4	NR	NR	R	NR	NR	R	R	NR	R	NR	NA	R
Chemical Disposal Site No. 5	R	R	R	NR	NR	R	R	NR	R	NR	NA	R
Chemical Disposal Site No. 3	R	R	R	NR	NR	R	R	NR	R	NR	NA	R
Landfills No. 3 and 4	R	R	R	NR	NR	R	NR	NA	R	NR	NA	R
Chemical Disposal Site No. 8	NA	R	R	R	R	NA	R	NA	R	NR	R	NA
Landfill No. 1	R	R	R	NR	NR	R	NR	NA	R	NR	NA	R
Firefighter Training Area No. 1	NR	R	R	R	R	R	R	R	PU	NR	R	R
Drum Disposal Site No. 1	R	R	R	NR	NR	R	NR	R	R	NR	NA	R
Landfill No. 11	R	R	R	NR	NR	R	NR	NA	R	NR	NA	R
Landfill No. 5	R	R	R	NR	NR	R	NR	NA	R	NR	NA	R
Chemical Disposal Site No. 2	R	R	R	NR	NR	R	NR	R	R	NR	R	R
Chemical Disposal Site No. 1	NA	R	R	R	R	R	R	NA	R	NR	R	R
Chemical Disposal Site No. 9	R	R	R	NR	NR	R	R	NA	R	NR	NA	NR
Abandoned Underground Tank Area	NR	NR	R	NR	NR	R	NR	NA	R	NR	NR	NA

Key:
- R = Restriction.
- NR = No restriction.
- NA = Not applicable.
- PU = Present use.

Note: See Table 6.2-2 for definitions of land use restrictions.

Source: ESE, 1984.

collected and analyzed for the parameters in List B, Table 6.1-2 to determine if migration is occurring. A specific containment plan or content removal may be required if migration is detected.

6.2 RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified disposal sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to ensure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal sites at VAFB are presented in Table 6.2-1. Descriptions of the land use restriction guidelines are presented in Table 6.2-2. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

to detect hydrocarbons emanating from the area. In addition, base personnel may periodically check this area to assure that the cover is not eroding and leachate formation is not occurring.

Landfill No. 5 (LF-5)

The only Phase II monitoring activity recommended for this site is a survey for hydrocarbons. This survey can be performed using an OVA to detect hydrocarbons emanating from the area. In addition, base personnel may periodically check this area to assure that the cover is not eroding and leachate formation is not occurring.

Chemical Disposal Site No. 2 (CS-2)

This site is located on or directly adjacent to LF-11. Phase II monitoring recommended for this site is a hydrocarbon survey using an OVA. This survey can be conducted with the survey for LF-11.

Chemical Disposal Site No. 1 (CS-1)

Phase II monitoring recommended for this site includes the collection and analysis of soil samples for the washrack pad at Bldg. 11137.

Chemical Disposal Site No. 9 (CS-9)

Phase II monitoring at this site should include the installation of one upgradient and two downgradient monitor wells. Ground water samples should be collected and monitored for the parameters in List A, Table 6.1-2.

If ground water contamination is detected, additional wells may be required to determine the extent.

Abandoned Underground Tank Area (AUTA)

A geophysical survey should be performed in the area where the abandoned underground tanks are expected. Based on the results of this survey, one upgradient and two downgradient well locations should be selected for the installation of monitor wells. Ground water samples should be

USAFVAND 10/10/84

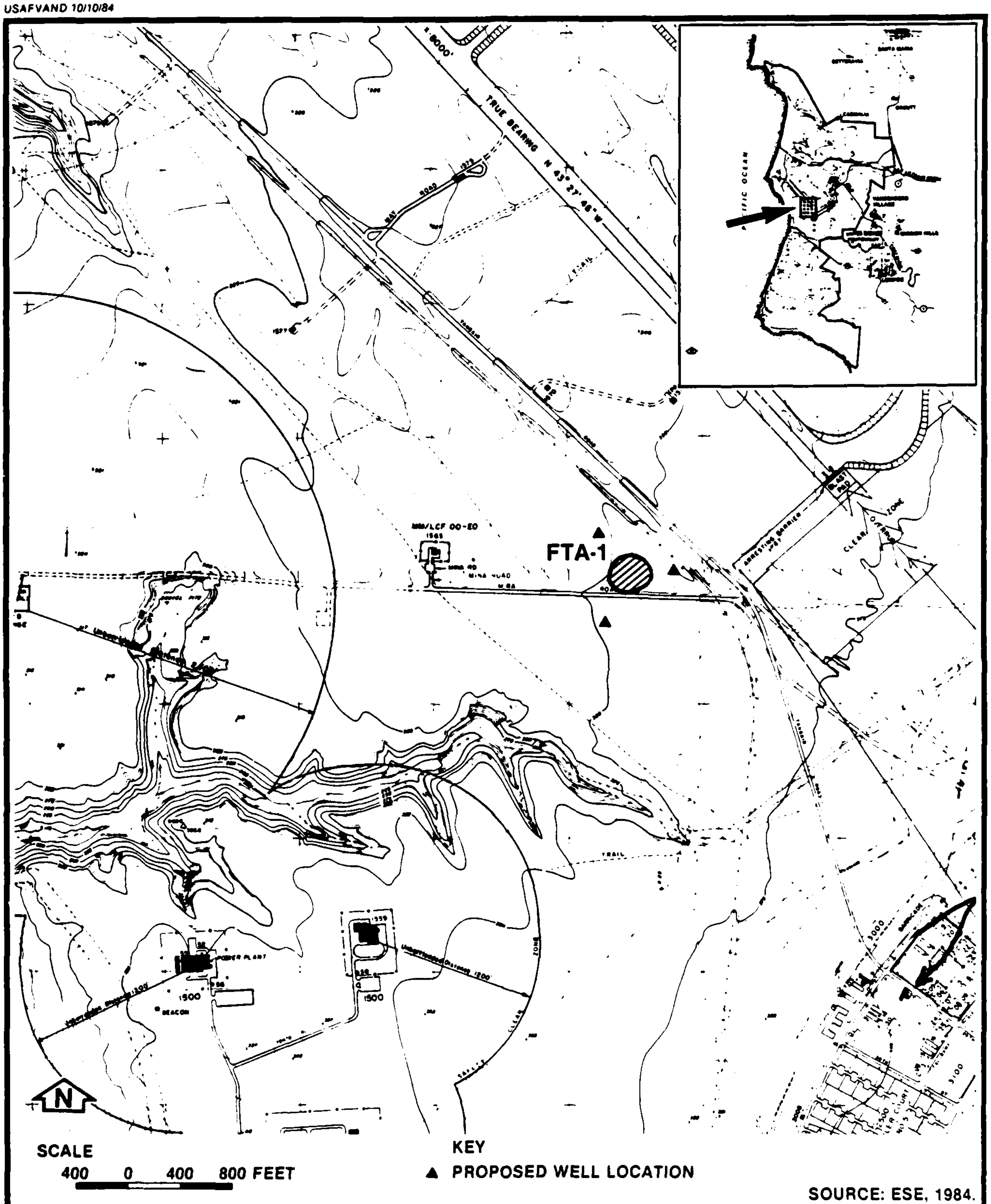

Figure 6.1-4
PROPOSED MONITOR WELL LOCATIONS AT FTA-1

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

If ground water contamination is detected, additional wells may be required to determine the extent.

Firefighter Training Area No. 1 (FTA-1)

The recommended Phase II monitoring program for this site should include the installation of one upgradient and two downgradient wells (see Fig. 6.1-4). It is also recommended that the wells not exceed 100 ft in an effort to locate ground water. Ground water samples should be collected and analyzed for the parameters in Lists B and C, Table 6.1-2.

If contaminants are found, additional wells may be necessary to determine the extent. In addition, if contaminants are found, the soil may have to be removed in order to control migration.

Drum Disposal Site No. 1 (DDS-1)

The recommended Phase II program for this site includes both geophysical monitoring and well installation. A geophysical survey should be conducted at this site using electromagnetic and/or magnetometer techniques to locate the drum burial area. After location of the burial area, a monitor well can be installed immediately downgradient to determine if any contaminants are migrating (see Fig. 6.1-3). The ground water should be sampled and analyzed for the parameters in Lists B, C, and D, Table 6.1-2.

If contamination is detected, additional wells may be necessary to determine the extent. In addition, the drums may require excavation to remove the source of the contaminants.

Landfill No. 11 (LF-11)

The only Phase II monitoring activity recommended for this site is a survey for hydrocarbons. This survey can be performed using an OVA

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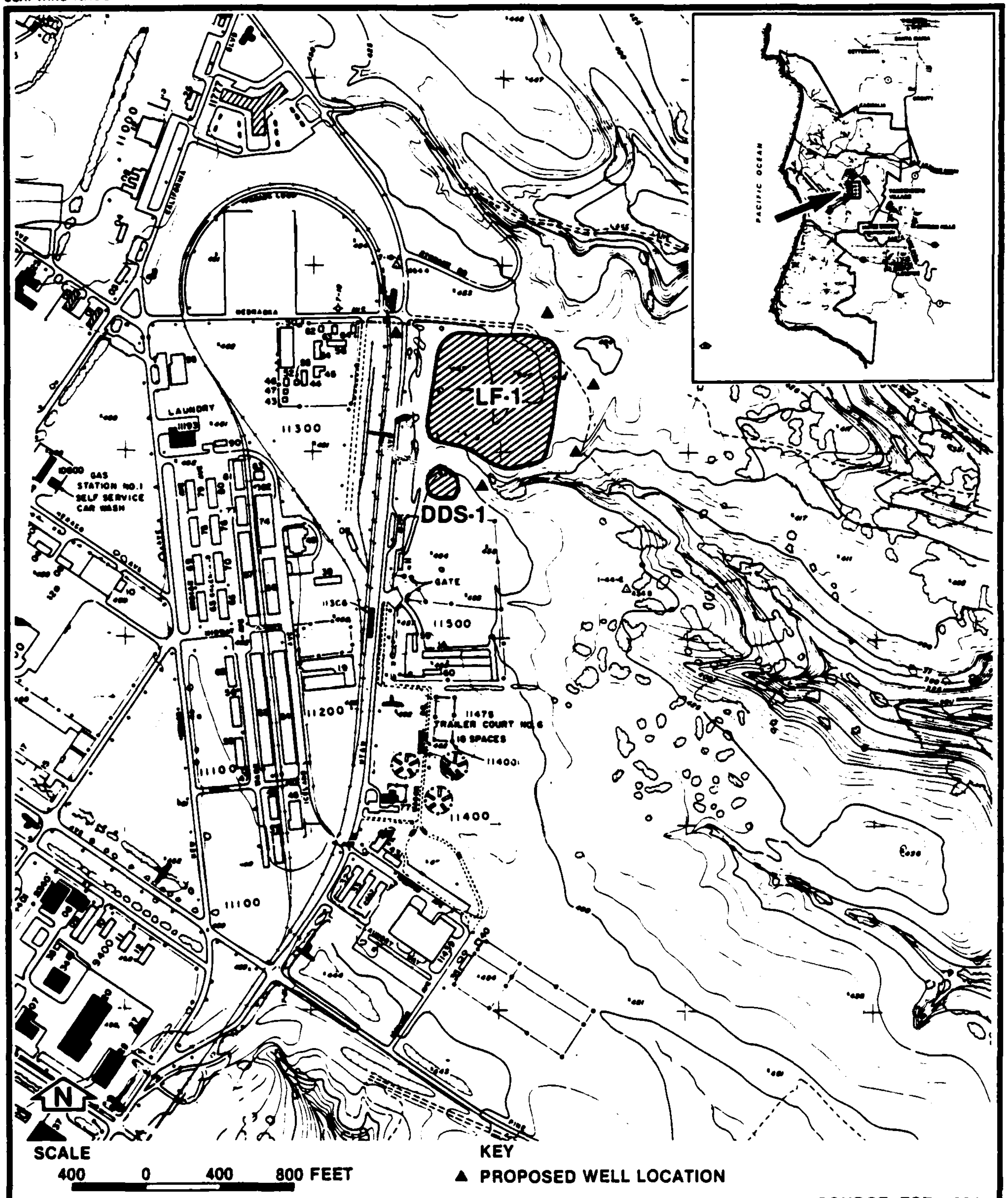

SOURCE: ESE, 1984.

Figure 6.1-3
PROPOSED MONITOR WELL LOCATIONS AT LF-1 AND DDS-1

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

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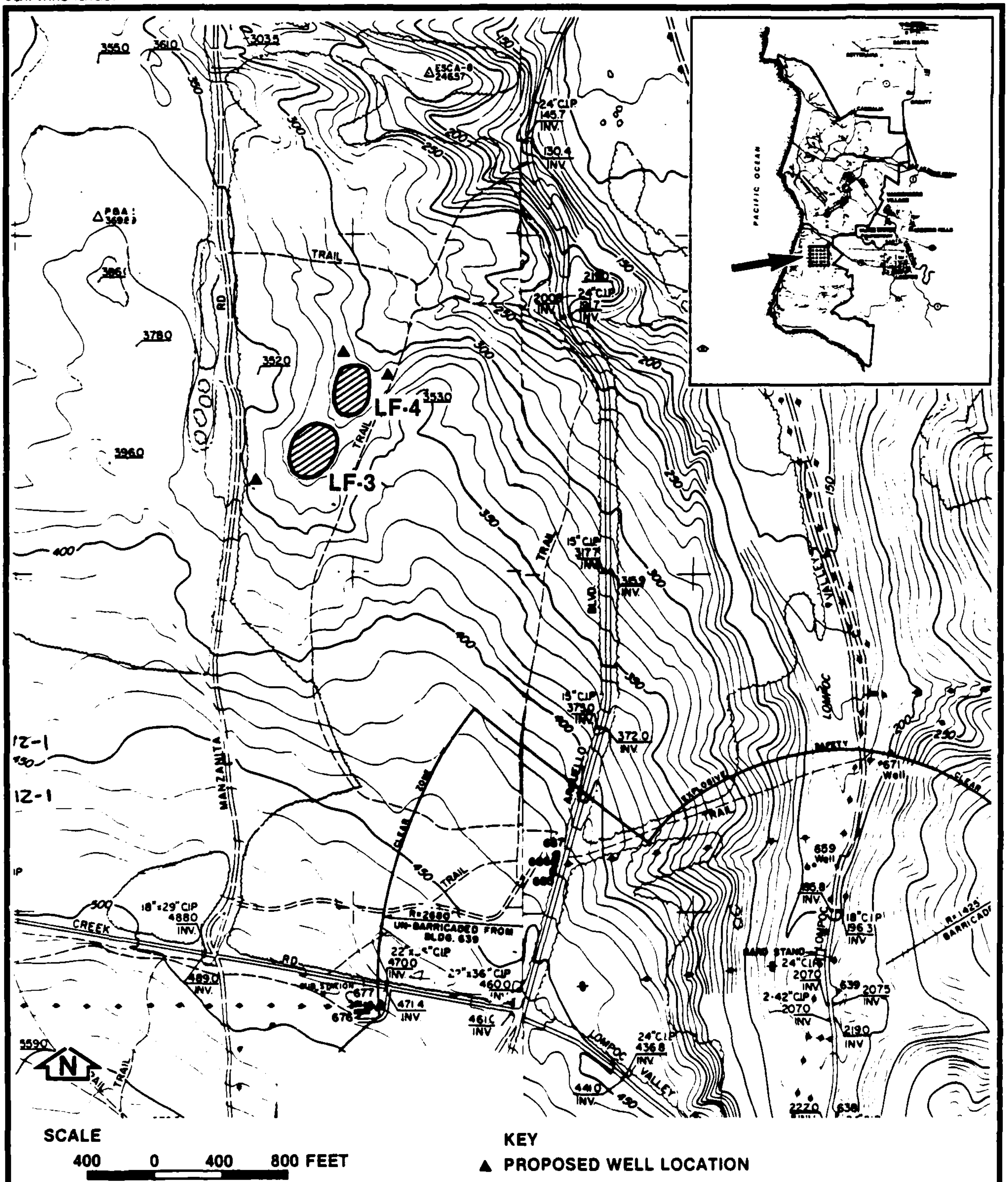


SOURCE: ESE, 1984.

Figure 6.1-2 PROPOSED MONITOR WELL LOCATIONS AT LF-3 AND LF-4	INSTALLATION RESTORATION PROGRAM Vandenberg Air Force Base

Landfills No. 3 and No. 4

These landfills are located immediately adjacent to each other and have been combined for the Phase II recommendations. A geophysical survey should be conducted to determine the areal extent of the landfills. The recommended Phase II monitoring program for these combined sites should include the installation of three monitoring wells. One well should be placed upgradient of LF-3 and the other two wells should be placed downgradient of LF-4 (see Fig. 6.1-2). It is also recommended that the wells should not exceed 100 ft in depth in order to reach ground water. Ground water samples from the wells should be analyzed for the parameters in Lists B, C, and D, Table 6.1-2. If contaminants are found, additional wells may be necessary to determine the extent of contamination.

Chemical Disposal Site No. 8 (CS-8)

The recommended Phase II monitoring program for this site should include the collection and analysis of three soil samples from the disposal area in the drainage ditch. In addition, one background soil sample should be collected upstream of the disposal area. Samples should be collected at depths up to 12 inches and analyzed for the parameters in Lists B and E, Table 6.1-2. If contaminants are found, additional samples may be required to determine the extent of contamination. If contaminated, removal of soil may be required.

Landfill No. 1 (LF-1)

The recommended Phase II monitoring for this site should include the installation of four wells. One well should be upgradient of LF-1, on the west side of Utah Ave. (see Fig. 6.1-3). The other three wells should be downgradient of the site. A geophysical survey (to include electromagnetic and/or magnetometer techniques) should be conducted to determine the areal extent of the landfill. The results of this survey can be used to assure the placement of the downgradient wells outside the landfill area. Ground water samples should be collected and monitored for the parameters in Lists B, C and D, Table 6.1-2.

If contamination is found in the ground water, additional wells may be necessary to determine the extent of the contamination. In addition, other measures may be necessary to decrease the formation of leachate and to remove contaminants from the ground water.

Chemical Disposal Site No. 6 (CS-6)

CS-6, located at SLC-3, is currently being monitored as part of a program established by BES. Monitor wells have been installed at the site. It is recommended that this program be continued in the base environmental program.

Chemical Disposal Site No. 7 (CS-7)

CS-7, located at SLC-4, is also being monitored as part of a base environmental program. Monitor wells have been installed at the site. It is recommended that this program be continued by VAFB.

Chemical Disposal Site No. 4 (CS-4)

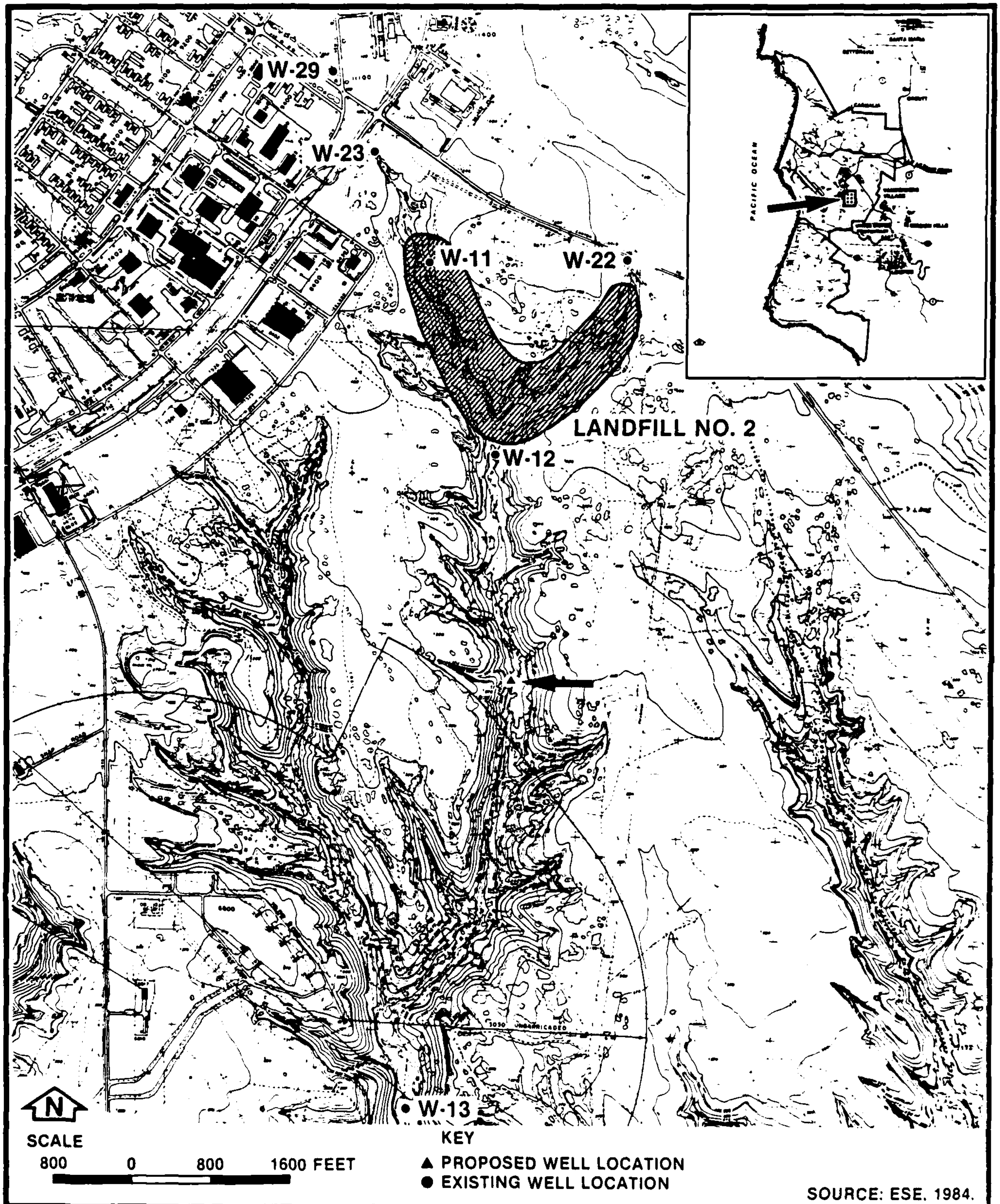
CS-4, located at the Agena Tank Farm, is also being monitored as part of a program to obtain data on the composition of the wastewater and ground water. It is recommended that this program, established by BES, be continued in the base environmental program.

Chemical Disposal Site No. 5 (CS-5)

CS-5, located at the Titan Tank Farm, is also being monitored to obtain data on the composition of wastewater and ground water. It is recommended that this program, established by BES, be continued as part of the base environmental program.

Chemical Disposal Site No. 3 (CS-3)

The Phase II monitoring at this site consists of sampling and analyzing the water from the lake to determine if contaminants exist. The water should be analyzed for the parameters in List A, Table 6.1-2.



SOURCE: ESE, 1984.

Figure 6.1-1
EXISTING AND PROPOSED MONITOR WELL LOCATIONS AT LF-2

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

APPENDIX A
GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

ABRES	Advanced Ballistics Reentry System
AEROSG	Aerospace Support Group
Aerozine 50	Mixture of 50 percent UDMH and 50 percent hydrazine
AF	Air Force
AFB	Air Force Base
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding water to a well or spring
ARRS	Aerospace Rescue and Recovery Squadron
AUTA	Abandoned underground tank area
AVGAS	Aviation gasoline
AVS	Audiovisual Squadron
BB	Bomarc burial site
BES	Bioenvironmental Engineering Services
cal	Caliber
CCTS	Combat Crew Training Squadron
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineering Squadron
CG	Communications Group
Chromium	A metal used in plating, cleaning, and other industrial applications; highly toxic to aquatic life at low concentrations, toxic to humans at higher levels

COE	Corps of Engineers
Contaminated fuel	Fuel which does not meet specifications for recovery or recycle
Contamination	Degradation of natural water quality to the extent that its usefulness is impaired; degree of permissible contamination depends on intended use of water
Contract disposal	Disposal of waste materials through prearranged agreements with offbase vendors; disposal of hazardous wastes is by contract with licensed hazardous waste disposal companies; contract disposal of salvageable materials (scrap metal, tires, dried sewage sludge) is typically through local scrap firms, manufacturers of the original product, or other recycling merchants
CS	Chemical disposal site
DDS	Drum disposal site
DDT	Dichlorodiphenyltrichloroethane
DEQPPM	Defense Environmental Quality Program Policy Memorandum
Det.	Detachment
DF-2	Diesel fuel No. 2
Disposal of hazardous waste	Discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste, or any constituent thereof, may enter the environment, be emitted into the air, or be discharged into any waters, including ground water
DOD	Department of Defense
Downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows
DPDO	Defense Property Disposal Office
Effluent	Liquid waste discharged in its natural state or partially or completed treated, from a manufacturing or treatment process
EOD	Explosive Ordnance Disposal

EP	Extraction procedure--EPA's standard laboratory procedure for leachate generation
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FS	Fuel spill site
ft	Feet
FTA	Firefighter training area
FTD	Field Training Detachment
FWS	U.S. Fish and Wildlife Service
gal	Gallon
gal/yr	Gallons per year
GC/MS	Gas chromatography/mass spectrometry
gpm	Gallons per minute
Ground water	Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure
HARM	Hazard Assessment Rating Methodology
Hazardous waste	As defined in RCRA, a solid waste or combination of solid wastes which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed
HWS	Hazardous waste storage site
Hydrazines	Liquid rocket fuels consisting of hydrazine, methylhydrazine, and unsymmetrical dimethylhydrazine
Hypergols	Fuels consisting of various hydrazines in combination with various oxidizers (e.g., N_2O_4 and H_2O_2)

ICBM	Intercontinental ballistic missile
ICBMTMS	Intercontinental Ballistic Missile Test Maintenance Squadron
Infiltration	Movement of water through the soil surface into the ground
IR	Infrared
IRFNA	Inhibited red fuming nitric acid, an oxidizing agent used in rocket fuel
Iron	A metal commonly found in water as a consequence of dissolution of geologic materials; relatively nontoxic
IRP	Installation Restoration Program
ISCP	Installation Spill Control Plan
ITT-FEC	International Telephone and Telegraph--Federal Electric Corporation
JP-4	Jet propellant No. 4
lb/yr	Pounds per year
Leachate	A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water
Leaching	The process by which soluble materials in the soil, such as nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water
Lead	A metal additive to gasoline and used in other industrial applications; toxic to humans and aquatic life; bioaccumulates
LF	Landfill
Liner	A continuous layer of natural or manmade materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents, or leachate
LPG	Liquified petroleum gas

MEK	Methyl ethyl ketone, a solvent used in paint thinner, stripper, and a wide variety of industrial applications; suspected to be toxic to humans at high levels; potentially toxic to aquatic life
MGD	Million gallons per day
mg/l	Milligrams per liter
MIBK	Methyl isobutyl ketone, a solvent used in paint stripper, thinner, and a wide variety of industrial applications; suspected to be toxic to humans at high levels; potentially toxic to aquatic life
mm	Millimeter
MMH	Monomethyl hydrazine
MOGAS	Motor gasoline
mph	Miles per hour
msl	Mean sea level
NA	Not applicable
NASA	National Aeronautics and Space Administration
NCO	Noncommissioned Officer
NCOIC	Noncommissioned Officer-in-Charge
NIPDWR	National Interim Primary Drinking Water Regulations
Nitrate	A common anion in natural water
NPDES	National Pollutant Discharge Elimination System
NSDWR	National Secondary Drinking Water Regulations
N_2O_4	Chemical formula for nitrogen tetroxide, an oxidizer used in liquid rocket fuel
1STRAD	1st Strategic Aerospace Division
OIC	Officer-in-Charge

Onsite evaporation	A method of onsite disposal in which a waste is released into the environment either by spreading the waste over a small area near the job site or by allowing the waste to passively evaporate from the waste materials container
OVA	Organic vapor analyzer
PCB	Polychlorinated biphenyls--liquids used as a dielectric in electrical equipment; suspected human carcinogen; bioaccumulate in the food chain and causes toxicity to higher trophic levels
PD-680	Petroleum-based cleaning solvent; Stoddard solvent
Percolation	Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil
Permeability	The capacity of a porous rock, soil, or sediment of transmitting a fluid without damage to the structure of the medium
pH	Negative logarithm of hydrogen ion concentration; an expression of acidity or alkalinity
POL	Petroleum, oils, and lubricants
PVC	Polyvinyl chloride plastic
RCRA	Resource Conservation and Recovery Act
RP-1	Rocket propellant No. 1
RPO	Radiation Protection Officer
RS&H	Reynolds, Smith and Hills
SAC	Strategic Air Command
SAMTO	Space and Missile Test Organization
SCS	U.S. Soil Conservation Service
Silver	A metal used in photographic emulsions and other industrial operations; toxic to humans and aquatic life at low concentrations
SLC	Space Launch Complex
SMES	Strategic Missile Evaluation Squadron

SPCC	Spill Prevention Control and Countermeasure (Plan)
Spill	An unplanned release or discharge of a hazardous waste onto or into air, land, or water
STS	Space Transportation System
Sulfate	A common anion in sea water
SWS	Surface water sampling station
TCE	Trichloroethylene, a commonly used degreasing solvent; toxic to aquatic life and a suspected human carcinogen
UDMH	Unsymmetrical dimethyl hydrazine
UG	Underground
ug/l	Micrograms per liter
Upgradient	In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water
USAF	U.S. Air Force
UXO	Unexploded ordnance
VAFB	Vandenberg Air Force Base
Water table	Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere
WSMC	Western Space and Missile Center
yd^3/yr	Cubic yards per year
Zinc	A metal with a wide variety of industrial applications, particularly corrosion-resistant; highly toxic to aquatic life, slightly toxic to humans at high dose levels

APPENDIX B

TEAM MEMBER BIBLIOGRAPHY

JOHN D. BONDS, Ph.D.
Senior Scientist/Project Manager

ESE PROFESSIONAL RESUME

SPECIALIZATION

Project Management, Atmospheric Chemistry, Water Chemistry, Industrial Hygiene, Quality Assurance, Hazardous Waste

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Leader--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Initial Assessment for Hazardous Wastes at Army Installations, Team Leader--Comprehensive study at 48 Army installations to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Initial Assessment Studies for the Naval Energy and Environmental Support Activity, Team Leader--Evaluating 2 Naval installations with regard to past hazardous waste generation, storage, treatment, and disposal practices. Investigations include records review, aerial and ground site surveys, employee interviews, and limited sampling and analysis including geophysical techniques. Determine extent of contamination at former disposal/spill sites, potential for contaminant migration, and potential effects on human health and the environment.

Phase II Confirmation Studies to Determine the Presence and Migration of Hazardous Wastes from Military Installations, Team Leader--Five comprehensive field studies to determine the actual sites where hazardous substances were used, their current concentrations in soils, surface waters and groundwater, and an assessment of the quantities which may migrate from the installation. The study also included recommendations for decontamination operations.

Determination of Hazardous Chemicals in Landfills, Project Manager--Several studies in which field sampling techniques and laboratory methods were developed to determine the existence and concentrations of explosive gases generated by landfill operations, priority pollutants escaping to the atmosphere and contaminating the groundwater.

Preparation of Quality Assurance Guidelines for EPA Project Officers, Project Manager--Preparation of QA guidelines for use by EPA project officers in selecting contractors for projects requiring sampling and analysis. Also included guidelines for quality assurance audits of the field sampling and analysis portion of any awarded contract. EPA publication 600/9-79-046 entitled Quality Assurance Guidelines for IERL-Ci Project Officers was produced under this project.

Air Compliance Testing of Industrial Sources, Project Manager--Various projects involving compliance testing at petroleum refineries, Kraft pulp mills, power plants, iron and aluminum smelting operations, and various other industries.

Ambient Air Monitoring, Project Manager--Various projects to determine ambient air concentrations of sulfur oxides, particulates, nitrogen oxides, carbon monoxide, photochemical oxidants, priority pollutant organics, and hydrocarbons.

EDUCATION

Ph.D.	1969	Analytical Chemistry	University of Alabama
B.S.	1963	Chemistry	University of Alabama

U.S. EPA Air Pollution Training Institute: Quality Assurance for Air Pollution Measurement Systems--workshop graduate (1977)

ASSOCIATIONS

American Chemical Society
American Industrial Hygiene Association
Air Pollution Control Association

REPORTS AND PUBLICATIONS

Over 50 reports and publications on Installation Assessments, source air emissions, hazardous materials and quality assurance.

JEFFREY J. KOSIK, B.S.E.
Associate Engineer

ESE
PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Water and Wastewater Treatment, Water Supply and Field of Investigations

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Engineer--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Reassessment for Hazardous Wastes at Army Installation, Team Engineer--Comprehensive study at an Army installation to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Hazardous Waste Survey and Assessment and Review of Potential Liability for a Major U.S. Industrial Corporation, Project Engineer--Comprehensive survey of over 50 corporate facilities to determine past and present activities with respect to the use of hazardous substances, quantities used, disposal methods, disposal sites and potential legal liability of those activities. Study also includes an assessment of compliance with regulations.

Industrial Wastewater Treatment/Disposal Systems Design and Permitting, Project Engineer--Several projects for the conceptual and final design of a treatment/disposal system, design of treatment instrumentation systems, and permitting.

Effluent Guidelines Development for the Pharmaceuticals Manufacturing Point Source Category, Project Engineer-- Comprehensive study for wastewater characterization, treatment system performance evaluation, and estimation of installation and operating costs for treatment systems to remove toxic and conventional pollutants.

EDUCATION

B.S.E.	1982	Environmental Engineering	University of Florida
1984	Hazardous Materials/Site Investigations Training Course		

AFFILIATIONS

Society of Environmental Engineers
American Water Works Association
Water Pollution Control Federation
Boy Scouts of America
American Red Cross

JULIUS W. HUNTER, JR., B.S.E.
Associate Engineer, Industrial Wastewater and Hazardous Materials Engineering

ESE PROFESSIONA[L] RESUME

SPECIALIZATION

Industrial Waste Operations Design and Permitting, Agricultural Systems and Engineering

RECENT EXPERIENCE

Preparation and Filing of an Industrial Wastewater Permit Application for a Spray Evaporation System, Aero Corporation, Lake City, Florida, Project Engineer--Involvement and responsibility for preparing application, support documents, design calculations, engineering plans and specifications, and client contact. Also responsible for project budget and cost control.

Preparation and Filing of an Industrial Waste Landfill Permit Application, Carolina Galvanizing Corporation, Aberdeen, North Carolina, Project Engineer--Involvement includes development of cover crop specifications; calculation, review, and revision; and production and review of engineering plans and specifications.

Design and Implementation of a Remedial Action System, Client Confidential, Florida--System involves the cleanup of a contaminated shallow ground water aquifer. Involvement includes design of system to pump contaminated water to nearest POTW outlet; coordination with project geologists on system sizing and requirements; assessment and review by city, county, and state engineers; meeting with client, city consultant, county officials, and adjoining property owners; and sizing, specification, purchase, and installation supervision for entire system.

Field Work in Conjunction with EPA, Effluent Guidelines Division Sampling, Mobay Corporation, New Martinsville, West Virginia--Intensive 3-week industrial wastewater treatment system. Include location and setup of composite samplers; fractioning samples; troubleshooting automatic sampler and sample sites; handling, packaging, and shipping of samples, day-to-day interaction with plant personnel, and trip report preparation.

RELATED INDUSTRY EXPERIENCE

Plant Engineer at a 250-employee food production/processing plant. Responsibilities included preventative maintenance; supervision of 20-member maintenance staff, scheduling budgeting and cost control for maintenance department; direct control of purchasing; equipment design specification and modification; and day-to-day interaction with plant personnel. Reported directly to President of company. Was directly responsible for all environmental and operations permits, including sanitary wastewater, air, and industrial wastewater. Conducted onsite sampling program to characterize wastes, assisted in hydrogeologic tests to determine soil permeability, and aided consultant in system sizing and specifications.

Implemented water conservation program which decreased treatment system cost from $320,000 to $85,000. Primary company representative in negotiations with state regulatory agency regarding industrial wastewater permit application and ground water monitoring plan.

EDUCATION

B.S.E.	1981	Agricultural Engineering	University of Florida

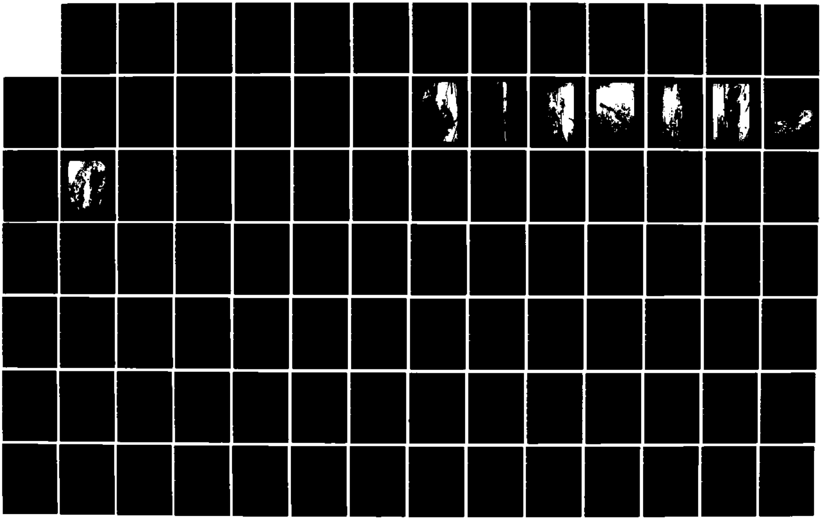
REGISTRATIONS

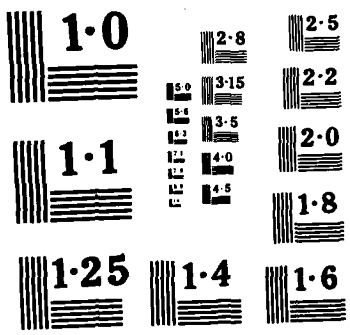
Engineer Intern, 1981, Florida

ASSOCIATION

American Society of Agricultural Engineers

AD-A155 822 INSTALLATION RESTORATION PROGRAM PHASE I RECORDS SEARCH 3/4
VANDENBERG AIR FO..(U) ENVIRONMENTAL SCIENCE AND
ENGINEERING INC GAINESVILLE FL J D BONDS ET AL. DEC 84
UNCLASSIFIED F08637-83-G-0010 F/G 13/2 NL

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1·4
1·6

DONALD F. McNEILL, M.S.

Professional Resume

Areas of Specialization

Hydrogeology, Ground Water Monitoring and Evaluation, Clastic Sedimentology, Carbonate Sedimentology, Peat and Organic Sediment Analysis, Geomorphology, Stratigraphy, Field Mapping, and Sampling Techniques

Experience

Associate Scientist, Water Resources Department, Gainesville, Florida, 1983 to present.

Florida Department of Environmental Regulation, Site Contamination Assessment, Project Hydrogeologist--Investigated organic and inorganic contamination at City Chemical Company, Orlando, Florida. Assessment of shallow aquifer with respect to contaminant migration.

EDB Contamination Investigation, Project Hydrogeologist--Investigated EDB contamination of drinking water wells at Sanford, Florida, including drilling and field sampling, installation of piezometers, measuring water levels and sampling wells, evaluating alternatives, and preparing report.

Adcom Wire Company, Project Hydrogeologist--Development of a ground water monitoring plan for a wire galvanizing plant including site analysis, geohydrology, and proposed ground water monitoring network.

Orange County, Project Hydrogeologist--Development of a ground water monitoring plan for a sanitary landfill near Orange, Florida. Project consisted of monitor well installation, measuring water levels, geohydrologic evaluation and report preparation.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Ft. Riley, Kansas. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Military District of Washington. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of West Virginia Ordnance Works. Geologic and ground water investigation of past waste disposal methods. Responsible for evaluation of ground water contamination and off-post contaminants migration.

U.S. Air Force Installation Restoration Program, Project Geologist--Installation assessment of Columbus, Andersen, and Vandenburg Air Force Bases. Responsible for geohydrologic evaluation of sanitary and solid waste disposal areas, and the potential for off-post migration.

Minerals Management Service, Project Geologist--Responsible for sediment core and sediment trap analysis for evaluation of sediment transport in selected areas of the Gulf of Mexico.

Research Assistant, Department of Geology, University of Florida, 1981 to 1983.

University of Florida, Research Associate--Texaco U.S.A.- funded research grant involving the development of a method of increasing BTU values in autochthonous mineral-rich peats and organic sediments.

Department of Energy and Governor's Energy Office, State of Florida, Research Assistant--Florida fuel grade peat assessment program conducted through the University of Florida; involved sampling, mapping, and analysis of Florida fuel peat resources.

Education

M.S.	1983	Geology	University of Florida
B.S.	1981	Geology	State University of New York

Affiliations

American Association of Petroleum Geologists--Energy Minerals Division
Geological Society of America
Southeastern Geological Society
Society of Economic Paleontologists and Mineralogists

Publications

Griffin, G.M., Wieland, C.C., and McNeill, D.F. 1982. Assessment of the Fuel Grade Peat Resources of Florida. U.S. Department of Energy and the Governor's Energy Office, State of Florida, Tallahassee, Florida.

McNeill, D.F., and Stauble, D.K. 1985. Coastal Geology and the Occurance of Beackrock; Central Florida Atlantic Coast. Geological Society of America, Field Trip for 1985 Annual Meeting, Orlando, Florida (in preparation).

McNeill, D.F., and Sawyer, R.K. 1984. A Method for Increasing BTU Values in Autochthonous Mineral Rich Organic Sediments (in preparation).

APPENDIX C

LIST OF VAFB INTERVIEWEES
AND OUTSIDE AGENCY CONTACTS

APPENDIX C

LIST OF VAFB INTERVIEWEES

	Interviewee	Years of Service
1.	Vehicle Maintenance Foreman, 4392nd TS	28
2.	Noncommissioned Officer-in-Charge (NCOIC), General Purpose Shop, 4392nd TS	8
3.	NCOIC, Printing Plant, 4392nd AD	2
4.	NCOIC, Acting Maintenance Supervisor, 394th ICBMTMS	20
5.	Bioenvironmental Engineer, USAF Hospital	2
6.	Bioenvironmental Engineer, USAF Hospital	2
7.	Supervisor, Pavement and Grounds Section, 4392nd CES	22
8.	Heavy Equipment Operator, 4392nd CES	18
9.	Heavy Equipment Operator, 4392nd CES	24
10.	NCOIC, Chief of Quality Assurance, Det. 8, 37th ARRS	10
11.	Disposal Officer, DPDO	3
12.	NCOIC, Industrial Hygiene, USAF Hospital	4
13.	NCOIC, Industrial Hygiene, USAF Hospital	2
14.	Officer-in-Charge (OIC), Environmental Planning, 4392nd CES	2
15.	NCOIC, Support Equipment Maintenance, Det. 8, 37th ARRS	6
16.	Technician, Nondestruct Inspection, Det. 41	1
17.	Foreman, Ordnance Equipment Maintenance, Det. 11, AFLC	6
18.	NCOIC, Chief of Missile Training Support, 1STRAD	3
19.	Deputy Commander, 392nd AFCC	1
20.	OIC, Assistant Chief of Maintenance, 392nd AFCC	2
21.	OIC, Chief of Material Control Branch, 392nd AFCC	1
22.	NCOIC, Maintenance Supervisor, 392nd AFCC	4
23.	Hazardous Waste Manager, Lockheed	4
24.	Hazardous Waste Manager, Stearns and Rodgers	12
25.	Construction Superintendent, Stearns and Rodgers	24

APPENDIX C

LIST OF VAFB INTERVIEWEES
(Continued, Page 2 of 3)

	Interviewee	Years of Service
26.	Industrial Relations Assistant, General Dynamics	22
27.	Operations Supervisor, General Dynamics	26
28.	Hazardous Waste Manager, Boeing	14
29.	Environmental Planner, 4392nd CES	4
30.	Manager, Main Cafeteria	12
31.	Manager, Service Station	3
32.	Base Fuels Officer, 4392nd Supply Squadron	17
33.	Base Fuels Quality Control Manager, 4392nd Supply Squadron	14
34.	Supervisor, Manned Power Plants, 4392nd CES	2
35.	Manager, Auto Hobby Shop, Morale, Welfare, and Recreation Division	14
36.	Supervisor, Structures Section, 4392nd CES	18
37.	Manager, Protective Coatings Shop, 4392nd CES	18
38.	Manager, Liquid Fuels Maintenance Shop, 4392nd CES	19
39.	Supervisor, Mechanical Section, 4392nd CES	35
40.	Manager, Exterior Electric Shop, 4392nd CES	15
41.	Manager, Water and Waste Treatment, 4392nd CES	17
42.	NCOIC, Security Police Vehicle Maintenance Shop	2
43.	Manager, GSA Motor Pool	10
44.	Foreman, GSA Motor Pool	10
45.	NCOIC, Combat Arms Maintenance Branch	2
46.	NCOIC, Security Police Arms and Equipment Maintenance	3
47.	Manager, Dry Cleaners and Linen Exchange	2
48.	Manager, Bionetics	20
49.	Shop Foreman, Rockwell	8
50.	Hazardous Waste Manager, Martin-Marietta	3

APPENDIX C

LIST OF VAFB INTERVIEWEES
(Continued, Page 3 of 3)

Interviewee	Years of Service
• Shop Foreman, Martin-Marietta	22
• Hazardous Waste Manager, ITT-FEC	3
• Supervisor of Shops, ITT-FEC	25
• Radiation Protection Officer	3
• Foreman, Pesticides Management Unit	24
• Wildlife Biologist, 4392nd CES	7
• Hazardous Waste Manager, 1369th AVS	26
• Chemist, Energy Management Laboratory	22
• Manager, Energy Management Laboratory	1
• Environmental Coordinator, 4392nd CES	4
• Heavy Equipment Operator, 4392nd CES	17
• Heavy Equipment Operator, 4392nd CES	20
• Fire Chief, 4392nd CES	21
• Chief, Engineering and Contracts Branch, 4392nd CES	20
• Fire Department, 4392nd CES	2
• NCOIC, Environmental Monitoring	7
• Former Heavy Equipment Operator, 4392nd CES	26
• Chief, Drafting Department, 4392nd CES	3
• Fire Department, 4392nd CES	3
• 394th ICBMTMS EOD	2
• Archaeologist, 4392nd CES	6

APPENDIX C

LIST OF OUTSIDE AGENCY CONTACTS

California Regional Water Quality Control Board, Ronald Sherer, Engineering Associate, San Luis Obispo Calif.

California Regional Water Quality Control Board, Eric Gobler, Associate Engineer, San Luis Obispo, Calif.

State of California Department of Health Services, Hazardous Waste Management Branch, John Hinton, Los Angeles, Calif.

State of California Solid Waste Management Board, John Bell, Chief of Facility Evaluation and Compliance, Sacramento, Calif.

Santa Barbara County Health Care Services, Richard Merrifield, County Solid Waste Inspector, Santa Barbara, Calif.

Washington National Records Center, Suitland, Md.

National Archives and Records Service--Cartographic Branch, Alexandria, Va., and Modern Military Branch, Washington, D.C.

Albert F. Simpson Historical Research Center, Maxwell Air Force Base, Ala.

U.S. Geological Survey, Arlington, Va., and Alexandria, Va.

California Division of Mines and Geology, Sacramento, Calif.

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

' STRATEGIC AEROSPACE DIVISION

the largest missile unit in SAC, 1STRAD's mission is fourfold: ıining SAC missile crew members in the Titan II and Minuteman II and . weapon systems, ICBM operational testing and evaluation, acting as :ice of primary responsibility for the NAVSTAR Global Positioning ıtem's Space and Control segments, and providing host support for the ıant organizations and contractors employed on VAFB.

.5TH COMBAT CREW TRAINING SQUADRON

: members of the 4315th CCTS train all SAC missile combat crew members › will serve in one of SAC's nine operational missile wings. The ıadron also provides instructor training courses, missile staff :icer courses, and the Ballistic Missile Staff Course for DOD :sonnel other than missile crews.

ıTH ICBM TEST MAINTENANCE SQUADRON

: 394th ICBMTMS is responsible for maintenance of the Titan II and ıuteman II and III weapon systems and ICBM operational testing and ıluation. The 394th ICBMTMS maintains launch facilities similar to ›se found at operational missile bases. This squadron also provides) capability within the Munitions Maintenance Section and ınsportation and storage of explosive ordnance and material.

)2ND AEROSPACE SUPPORT GROUP

: 4392nd AEROSG is responsible for operation and maintenance of the :ilities, utilities, and other resources necessary for base ıctioning.

: Security Police Squadron provides security and law enforcement ›port for VAFB's military-industrial aerospace facilities.

The mission of the Supply Squadron is to provide logistic support to all agencies onbase, ensuring they receive items required to perform the base mission.

The responsibilities of CES include maintenance and repair of 1,000 base buildings, fire prevention, maintenance of base utilities, environmental planning, and power production.

The Transportation Squadron on VAFB, the SAC's second largest transportation unit, is responsible for vehicle maintenance, public transportation, and traffic management.

WESTERN SPACE AND MISSILE CENTER

Established on Oct. 1, 1979, WSMC manages testing of space and missile systems for DOD, operates the Western Test Range, and provides contract administration services for AFSC activities at VAFB.

The Western Test Range functions as the test bed for space and missile operations. The range extends westward from the VAFB coastline, across the Pacific Ocean to the Indian Ocean. WSMC maintains an intricate network of electronic and optical tracking systems along the Pacific coast and on islands, ships, and planes downrange to monitor and control the ballistic missiles and space boosters launched by range users.

3901ST STRATEGIC MISSILE EVALUATION SQUADRON

The 3901st SMES personnel are considered experts on the operation and maintenance of the ICBM. The activities of the 146 officers and senior enlisted technicians assigned to the 3901st SMES cover the full range of ICBM functions.

AIR FORCE LOGISTICS COMMAND SUPPORT GROUP

The AFLC Support Group consists of three organizations: Det. 41, the Energy Management Laboratory; and Operating Location AD, Det. 3. Det. 41, the largest organization in the AFLC Support Group, is

ɪponsible for providing SAC, SAMTO, and other DOD agencies with depot ;ineering, logistics, maintenance, and technical services to support ınch programs.

ɜ Energy Management Laboratory provides a central location for ɜmical analysis testing for all agencies involved in missile ɜrations at VAFB. Operating Location AD, Det. 3, manages the ʇuisition and implementation of integrated logistics support for the ace Shuttle ground system at VAFB.

ΓIONAL AERONAUTICS AND SPACE ADMINISTRATION

SA is represented at VAFB by Kennedy Space Center (KSC), Johnson Space nter, Marshall Space Flight Center, and Langley Research Center. KSC tivities include Delta launch operations, spacecraft operations, data quisition and technical support, and Space Shuttle technical liaison. ddard, Johnson, and Marshall offices provide technical liaison with e correspondent USAF Space Shuttle operations at VAFB.

S. ARMY CORPS OF ENGINEERS

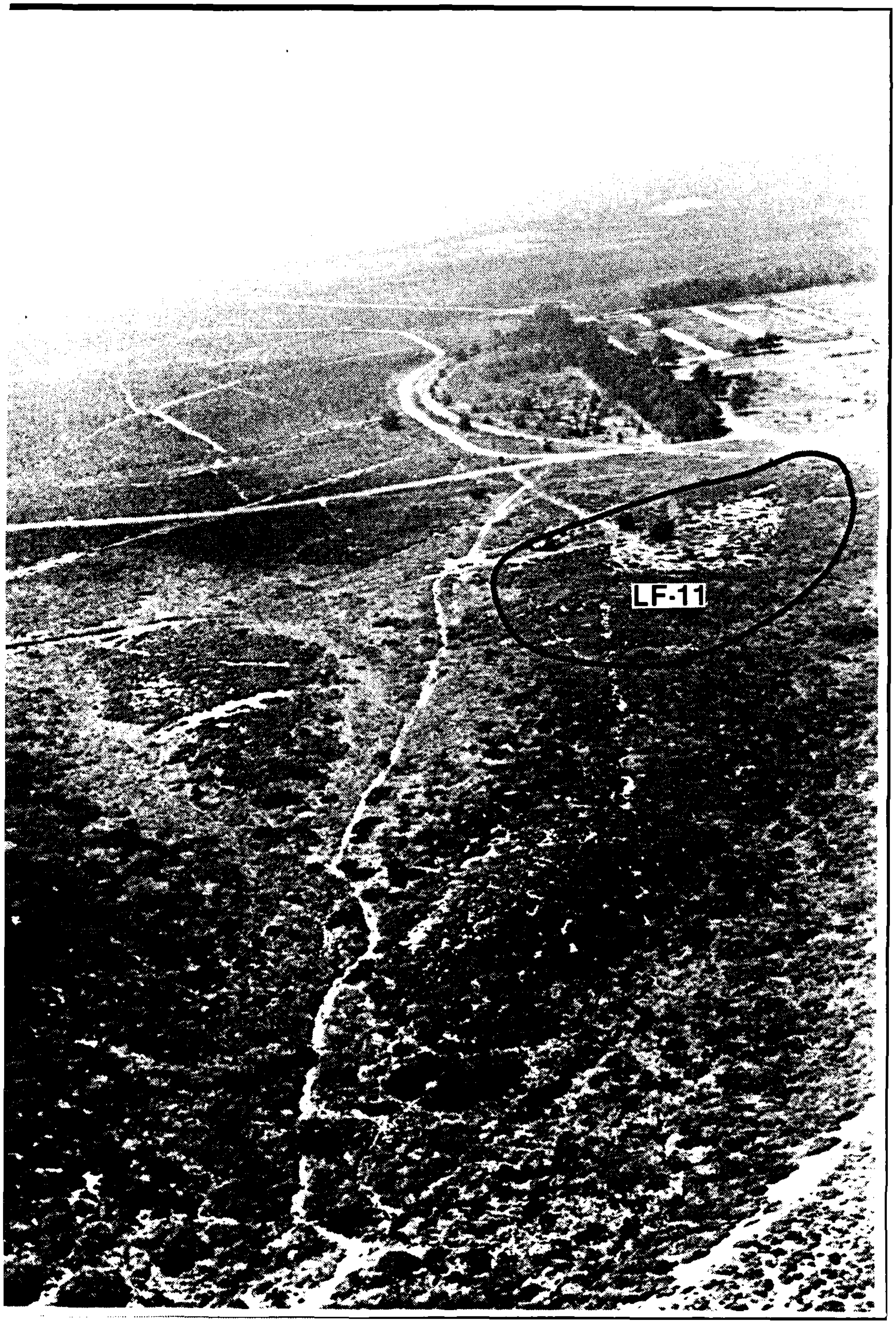
E has been the construction agent for USAF on VAFB since 1957. This sponsibility includes project design and construction administration.

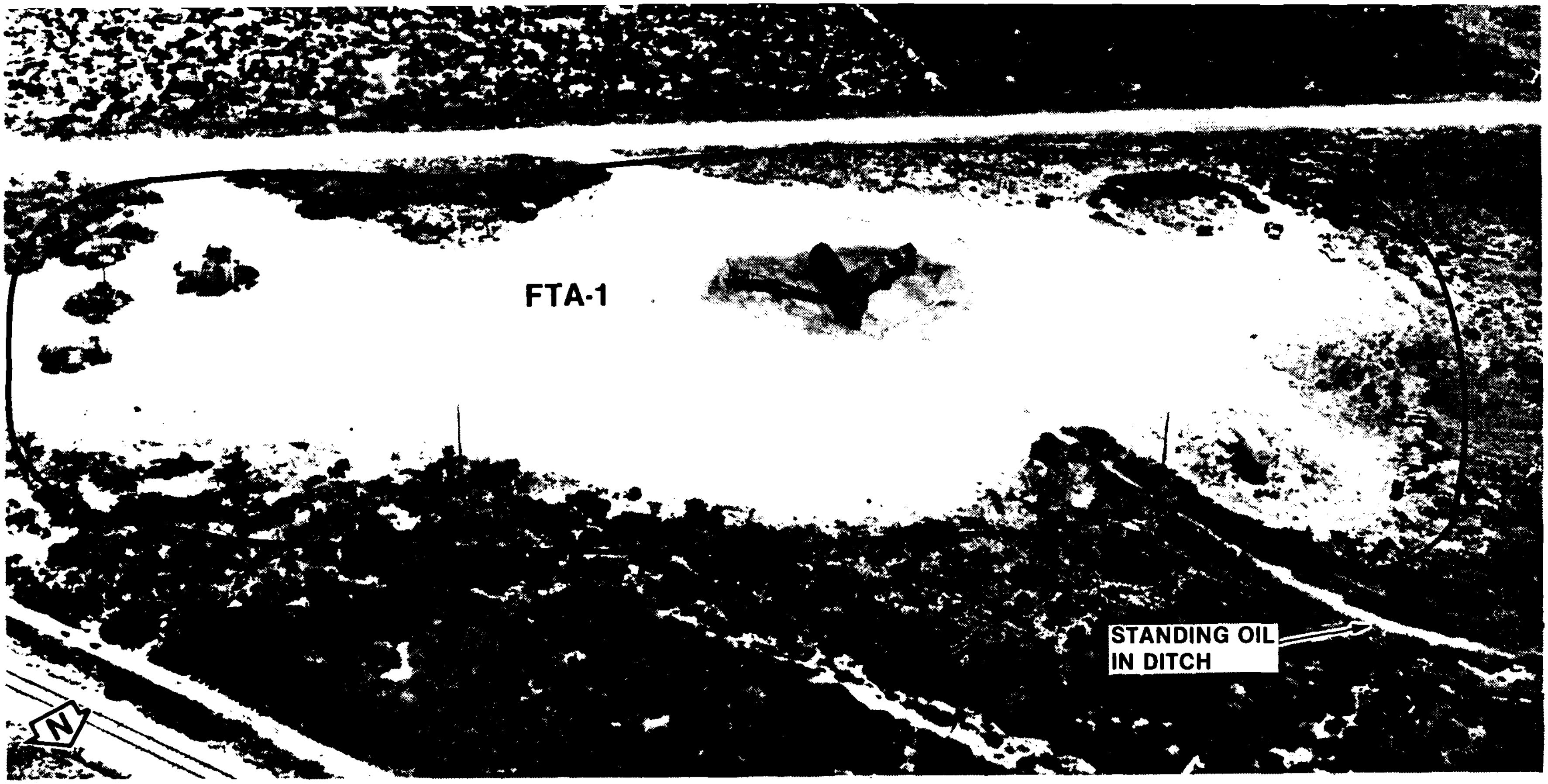
ELD TRAINING DETACHMENT 530

D 530 conducts maintenance training for SAC missile procedures trainer intenance crews. Currently, FTD 530 is developing and teaching urses in the construction and activation of station set facilities and ɔund support equipment for the STS at VAFB.

69TH AUDIOVISUAL SQUADRON

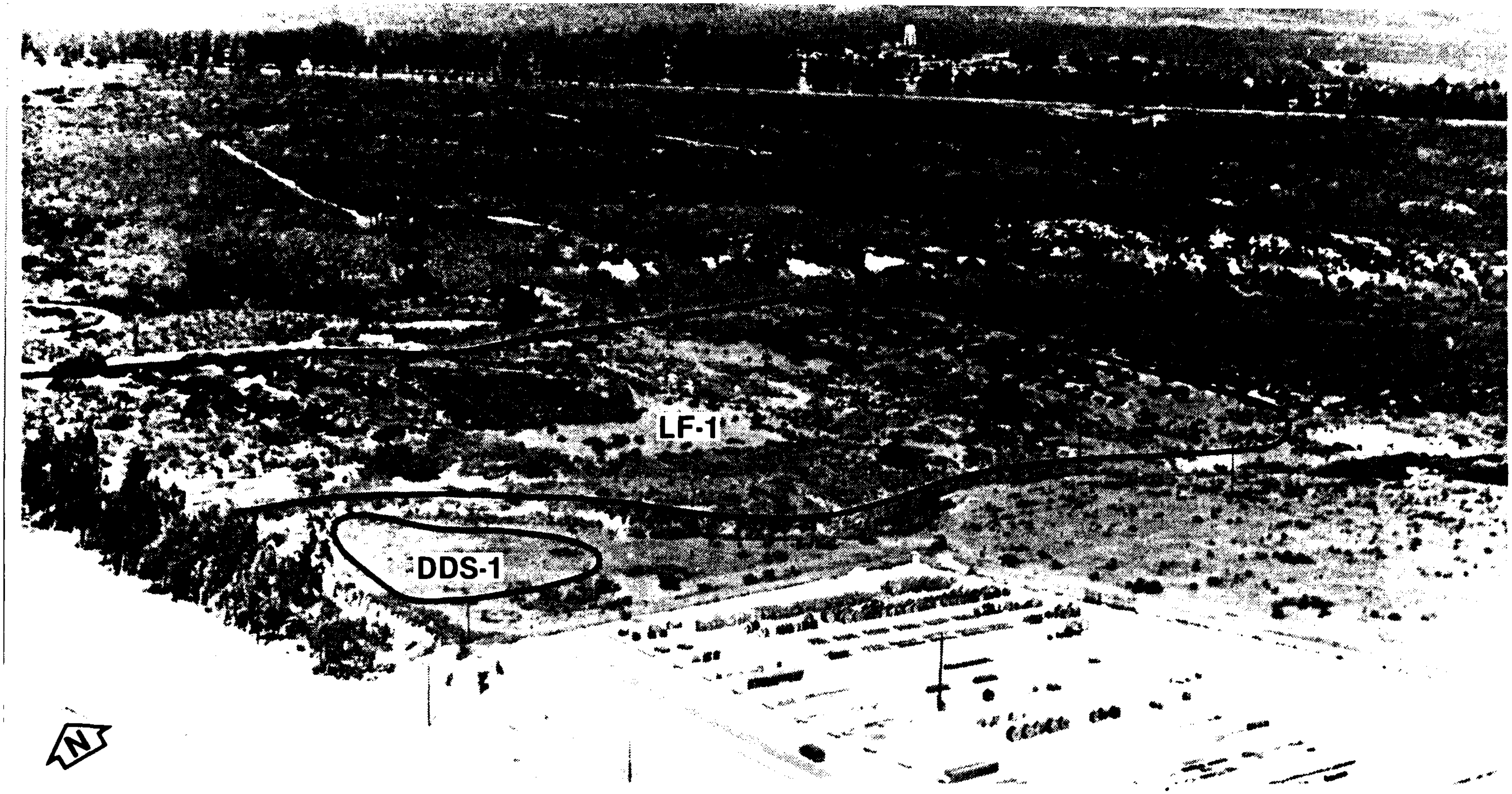
e 1369th AVS is the largest squadron in the Military Airlift Command's rospace Audiovisual Service, utilizing more than $8 million of state- -the-art audiovisual equipment in support of launch activities, USAF :umentation requirements, and base support.


LF-11



FIREFIGHTER TRAINING AREA (FTA-1)

INSTALLATION
RESTORATION PROGRAM
Vandenberg Air Force Base

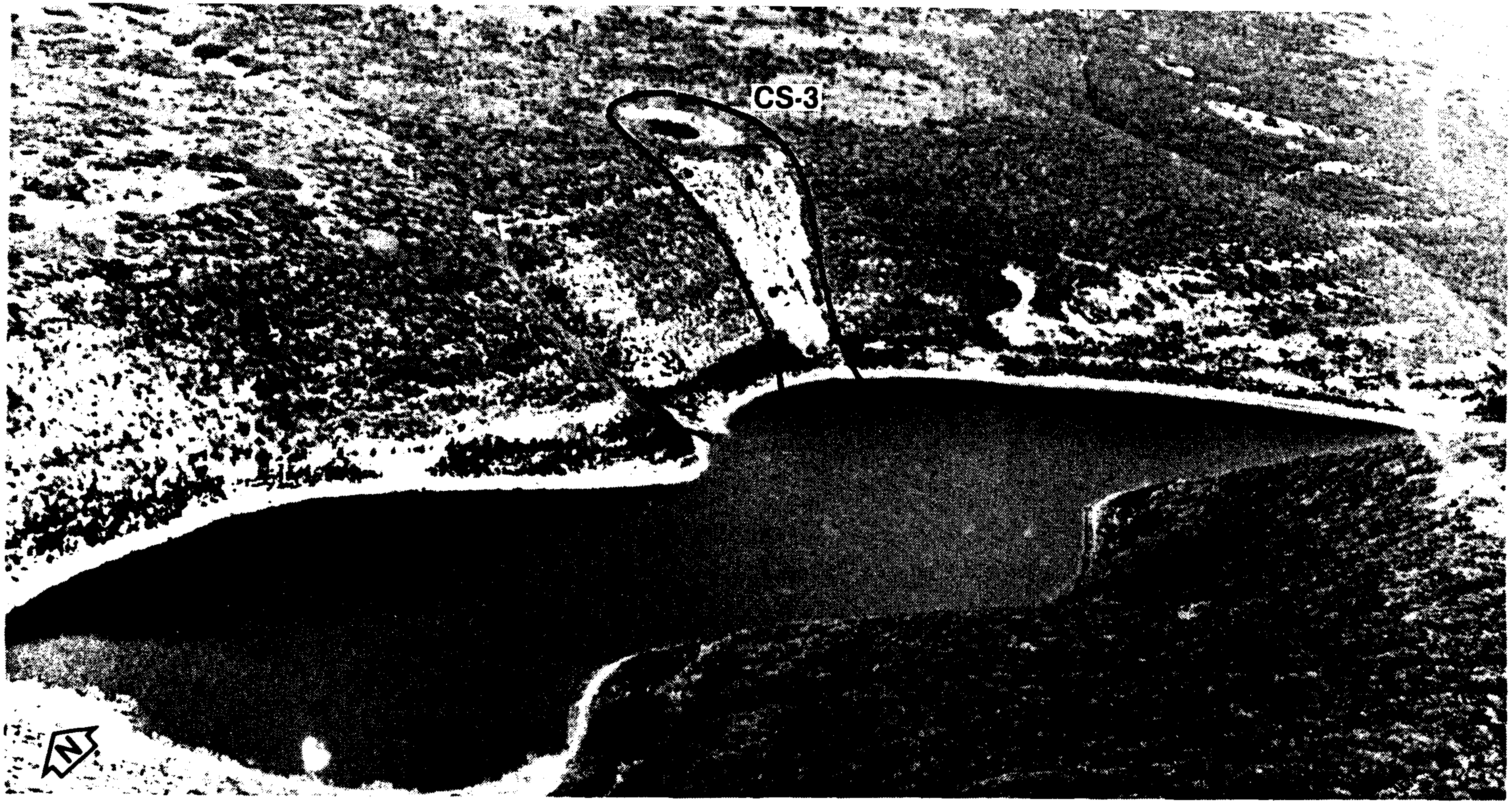


FORMER LANDFILL SITE (LF-1) AND DRUM DISPOSAL SITE (DDS-1)

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

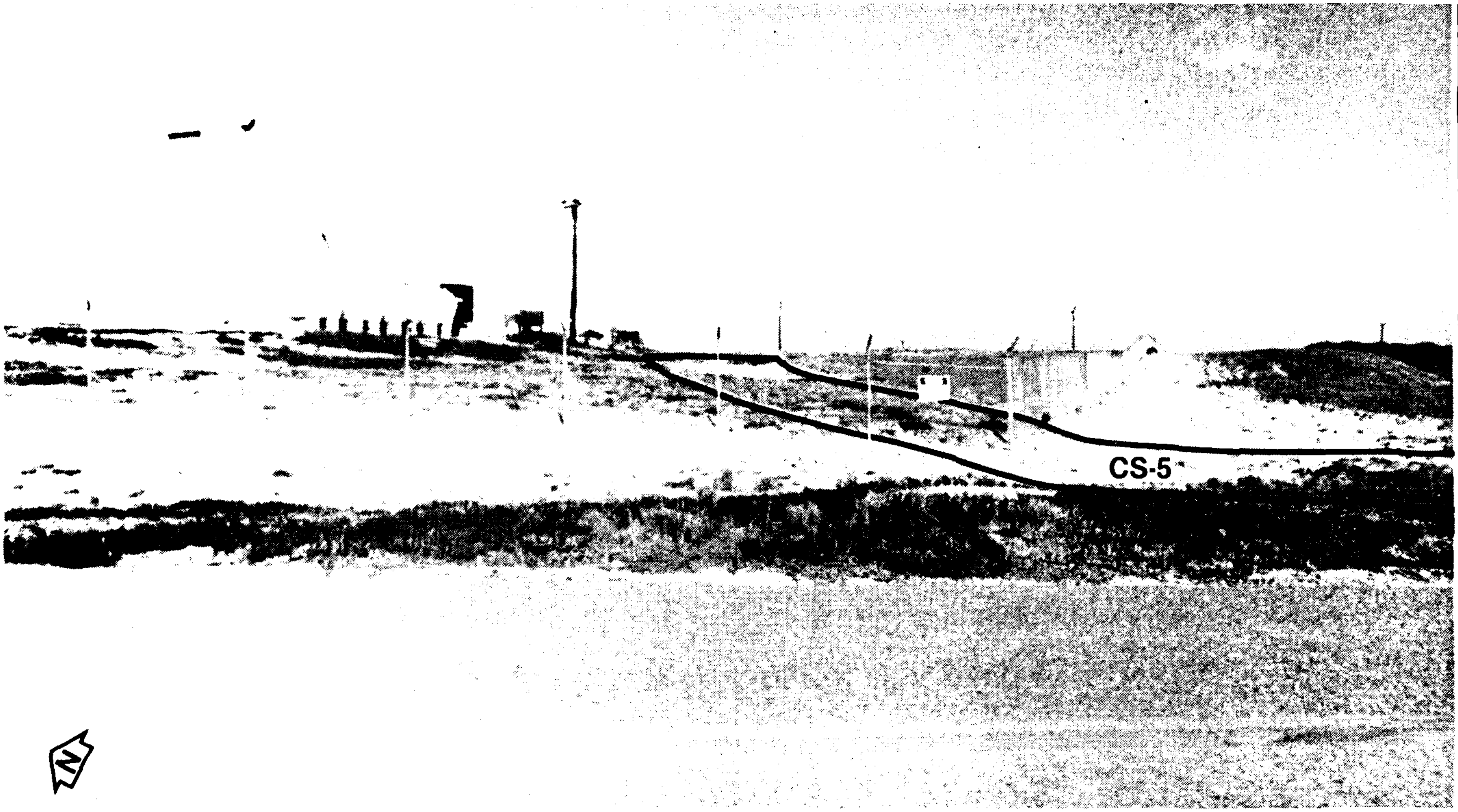
FORMER NAVY (SOUTH VAFB) LANDFILL SITES (*LF-3 AND LF-4*)

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base



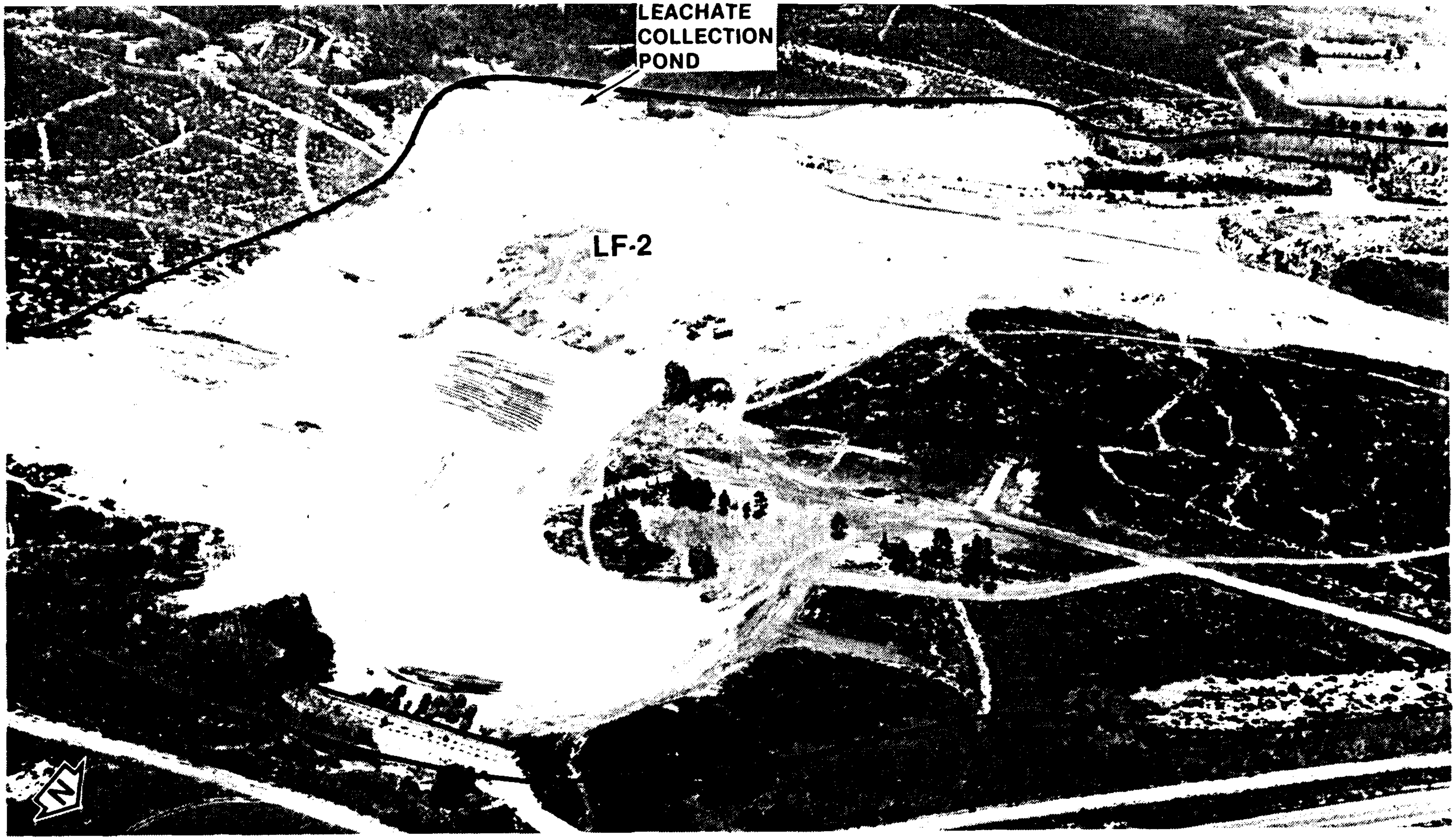
FORMER ABRES NEUTRALIZATION LAGOON
AND DISCHARGE AREA (CS-3)

INSTALLATION
RESTORATION PROGRAM
Vandenberg Air Force Base



AGENA TANK FARM NEUTRALIZATION LAGOON
DISCHARGE AREA (CS-5)

INSTALLATION
RESTORATION PROGRAM
Vandenberg Air Force Base



LANDFILL SITE (LF-2) AND LEACHATE COLLECTION POND	INSTALLATION RESTORATION PROGRAM Vandenberg Air Force Base

APPENDIX F

PHOTOGRAPHS

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 4 of 4)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
AL SERVICES ADMINISTRATION				
icle Maintenance Shop	875	Yes	Yes	CD
ACTORS				
netics				
rts-Cleaning Shop	8130	Yes	Yes	CD
tal-Plating Shop	8130	Yes	Yes	CD
kwell International	765	Yes	Yes	CD
tin-Marietta Corp.	8401	Yes	Yes	CD
-FEC				
int Shop	9320	Yes	Yes	CD
rts-Cleaning Shop	9320	Yes	Yes	CD
ectric Motor Shop	9320	No	No	
kheed Missile and Space Co.				
int Shop	8310	Yes	Yes	CD
oto Lab	8310	Yes	Yes	Silver recovery
avy Equipment Maintenance hop	8310	Yes	Yes	CD
lve-Cleaning Shop	8310	Yes	Yes	CD
arns-Rodgers, Inc.				
rrosion Control Shop	1792	Yes	Yes	CD
eral Dynamics				
las Launch Facility	SLC-3, 7525, 8305	Yes	Yes	CD
ing Aerospace Corp.				
int Shop	6525	Yes	Yes	CD

= Contract disposal.

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 3 of 4)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
MORALE, WELFARE, AND RECREATION DIVISION				
Auto Hobby Shop	6437	Yes	Yes	CD
SECURITY POLICE SQUADRON				
Vehicle Maintenance Shop	13600	No	No	
TRANSPORTATION SQUADRON				
Body Shop	10726B	Yes	Yes	CD
Base Maintenance and Equipment Shop	10713	Yes	Yes	CD
General Purpose Shop	10726A	Yes	Yes	CD
Minor Maintenance Shop	10706	Yes	Yes	CD
Special Purpose Shop	10713	Yes	Yes	CD
Refueling Maintenance Shop	7501	Yes	Yes	CD
Battery Shop	10726A	Yes	Yes	Neutralization
TENANTS				
AFLC SUPPORT GROUP, DET. 41				
Paint Shop	9327	Yes	Yes	CD
Machine Shop	9320	Yes	Yes	CD
Nondestruct (X-ray) Inspection Shop	1892	Yes	Yes	Silver recovery
DET. 8, 37th ARRS				
Helicopter Maintenance Shop	1735	Yes	Yes	CD
AGE Shop	1735	Yes	Yes	CD

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 2 of 4)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
Pavement and Grounds Section				
Heavy Equipment Maintenance Shop	10715	No	No	
Pavements Shop	0715, 717, 720	No	No	
Structures Section				
Protective Coatings Shop	11439	Yes	Yes	CD
Masonry Shop	7303	Yes	Yes	Discharged to storm drain
Mechanical Section				
Refrigeration/Air Conditioning Shop	11352	Yes	Yes	CD
Liquid Fuels and Maintenance Shop	11352	Yes	Yes	CD
Heating Shop	11352	No	No	
Electrical Section				
Exterior Electric Shop	11434	Yes	Yes	CD
Sanitation Section				
Water Treatment Plants	1200, 22310	No	No	
Wastewater Treatment Plant	1100-1110	No	No	
Fire Protection Branch				
Fire Extinguisher Maintenance Shop	9351	No	No	

APPENDIX E

MASTER LIST OF SHOPS

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
1STRAD				
394th ICBMIMS				
Field Maintenance Team	6601	No	No	
Pneudraulic Shop	6601	Yes	Yes	CD*
Mechanical Shop	6601	No	No	
Power, Refrigeration, and Electrical Shop	6601	Yes	Yes	CD
Electromechanical Shop	6601	Yes	Yes	CD
Missile Handling Team	8337	No	No	
Explosive Ordnance Disposal	1547	Yes	No	
Refurbishing/Corrosion Control Shop	1930	Yes	Yes	CD
4392nd AEROSG				
ADMINISTRATION DIVISION				
Printing Plant	7425	No	No	
SERVICES DIVISION				
Cafeterias	10343B	No	No	
Service Station	10600	Yes	Yes	CD
SUPPLY SQUADRON				
Agena Tank Farm	1180-1196	Yes	Yes	CD
Titan Tank Farm	6830-6836	Yes	Yes	CD
CIVIL ENGINEERING SQUADRON				
Power Production Section				
Field Power Shop	11439	Yes	Yes	CD
Manned Power Shop	Various	No	No	

APPENDIX E

MASTER LIST OF SHOPS

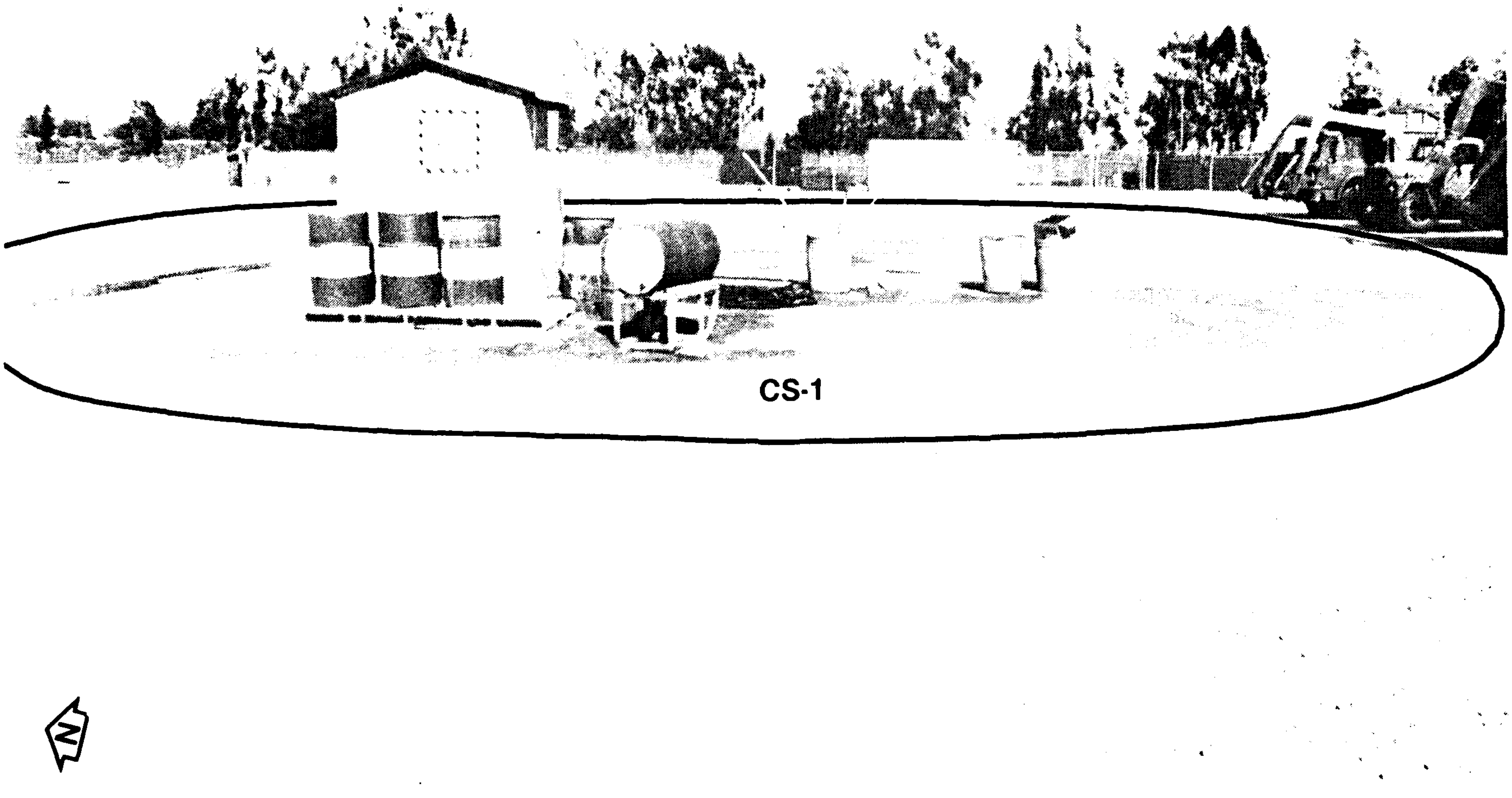
37TH AEROSPACE RESCUE AND RECOVERY SQUADRON, DET. 8

The 37th ARRS, Det. 8, provides helicopter support for all VAFB hosts and tenants. Det. 8 has had at least three helicopters stationed at VAFB since their arrival in 1973.

392ND COMMUNICATIONS GROUP

The 392nd CG provides communications and air traffic control services for VAFB. The group operates and maintains one of USAF's largest government-owned telephone systems and provides support for missile instrumentation and range safety during launch activities.

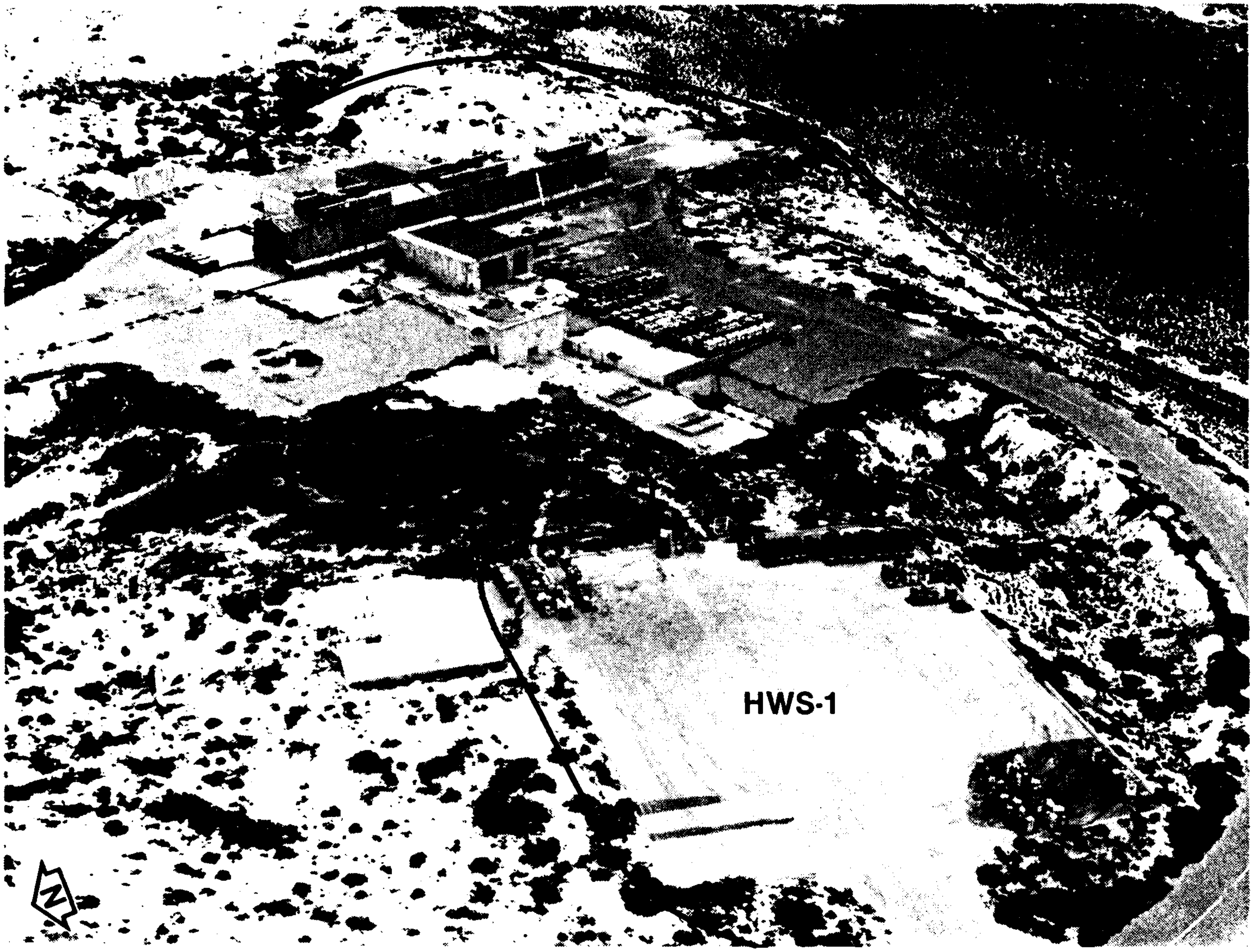
USAF VAND 10 10 84



FORMER PESTICIDE MIXING AND RINSEATE DISPOSAL AREA

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

USAF VAND 10/10/84



HAZARDOUS WASTE STORAGE AREA (HWS-1)

INSTALLATION RESTORATION PROGRAM
Vandenberg Air Force Base

APPENDIX G

USAF IRP HAZARD ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

JRPOSE

The purpose of the site rating model is to provide a relative ankinq of sites of suspected contamination from hazardous substances. ais model will assist the Air Force in setting priorities for follow-on ite investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that l) potential for contamination exists (hazardous wastes present in afficient quantity), and (2) potential for migration exists. A site an be deleted from consideration for rating on either basis.

ESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air orce's site rating model uses a scoring system to rank sites for riority attention. However, in developing this model, the designers ncorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search ortion (Phase I) of the IRP. Scoring judgments and computations are asily made. In assessing the hazards at a given site, the model evelops a score based on the most likely routes of contamination and ie worst hazards at the site. Sites are given low scores only if there e clearly no hazards at the site. This approach meshes well with the licy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of ie hazard posed by a specific site: the possible receptors of the ntamination, the waste and its characteristics, potential pathways for iste contaminant migration, and any efforts to contain the contami-ints. Each of these categories contains a number of rating factors iat are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, iltiplying by a factor weighting constant and adding the weighted ores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

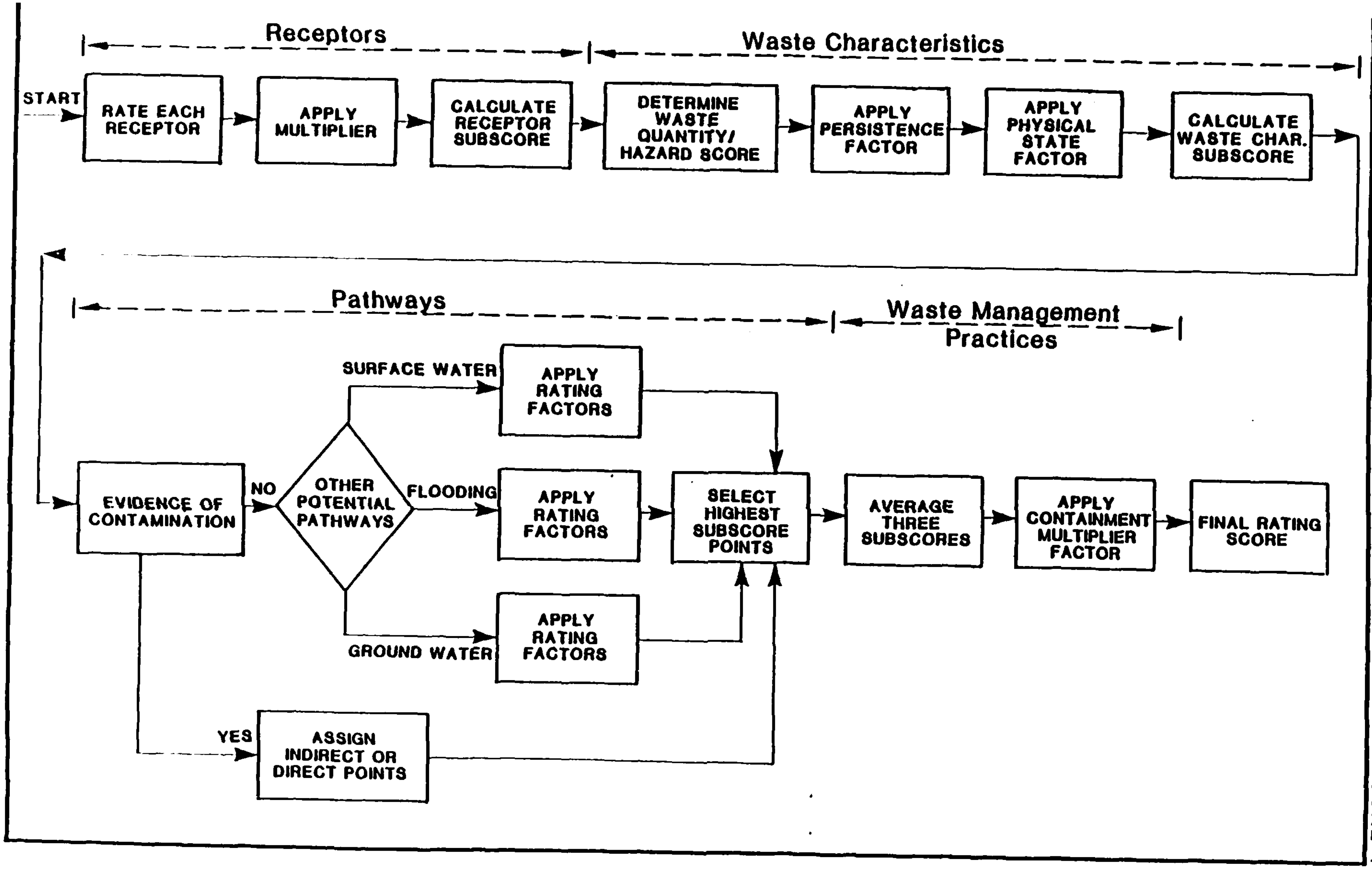

Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
YES
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 1

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

ITE ____________________

____

PERATION OR OCCURRENCE ____________________

RATOR ____________________

DESCRIPTION ____________________

D BY ____________________

TORS

Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
tion within 1,000 feet of site		4		
ce to nearest well		10		
se/zoning within 1 mile radius		3		
ce to reservation boundary		6		
al environments within 1 mile radius of site		10		
quality of nearest surface water body		6		
water use of uppermost aquifer		9		
tion served by surface water supply 3 miles downstream of site		6		
tion served by ground-water supply 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

TE CHARACTERISTICS

t the factor score based on the estimated quantity, the degree of hazard, and the confidence level of nformation.

laste quantity (S = small, M = medium, L = large) ______

onfidence level (C = confirmed, S = suspected) ______

lazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

persistence factor

r Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

physical state multiplier

ore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

YS

:tor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for
vidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no
or indirect evidence exists, proceed to B.

Subscore ______

migration potential for 3 potential pathways: surface water migration, flooding, and ground-water
1. Select the highest rating, and proceed to C.

ice water migration

ince to nearest surface water		8		
recipitation		6		
ice erosion		8		
ice permeability		6		
fall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

ling		1		

Subscore (100 x factor score/3) ______

id-water migration

to ground water		8		
recipitation		6		
permeability		8		
rface flows		8		
t access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

athway subscore.

highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

MANAGEMENT PRACTICES

he three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

tor for waste containment from waste management practices

al Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

S - Small quantity (<5 tons or 20 drums of liquid)
M - Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L - Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C - Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S - Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating

- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels: 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsurface	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. *This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for* waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

HAZARD ASSESSMENT RATING METHODOLOGY FORM

f Site: Chemical Spill Site No. 2 (CS-2)

on: Adjacent to LF-11 (Northeast Side)

f Operation or Occurrence: 1942-1959

Operator: Camp Cooke, VAFB

ts/Description: Waste Oil Disposal Area

ated By: J. Kosik, D. McNeill, and J. Bonds

CEPTORS

Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
pulation within 1,000 feet of site	1	4	4	12
stance to nearest well	1	10	10	30
nd use/zoning within 1-mile radius	2	3	6	9
stance to reservation boundary	0	6	0	18
itical environments within 1-mile dius of site	0	10	0	30
ter quality of nearest surface ter body	1	6	6	18
ound water use of uppermost uifer	3	9	27	27
pulation served by surface ter supply within 3 miles wnstream of site	0	6	0	18
pulation served by ground water pply within 3 miles of site	3	6	18	18
UBTOTALS			71	180
eceptors subscore (100 x factor core subtotal/maximum score subtotal)				39

ASTE CHARACTERISTICS

. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 50 x 1 = 50

. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 50 x 1 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
SUBTOTALS			36	108
Subscore (100 x factor score subtotal/maximum score subtotal)				33
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			16	114
Subscore (100 x factor score subtotal/maximum score subtotal)				14

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 33

WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	60
Pathways	33
TOTAL	137 divided by 3 = 46 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

46 x 1 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

f Site: Chemical Spill Site No. 1 (CS-1)

on: Pesticide Storage Area

f Operation or Occurrence: 1962-Present

Operator: VAFB

ts/Description: Pesticide Mixing and Storage Area

ated By: J. Kosik, D. McNeill, and J. Bonds

CEPTORS

Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
ipulation within 1,000 feet of site	3	4	12	12
stance to nearest well	1	10	10	30
ind use/zoning within 1-mile radius	2	3	6	9
.stance to reservation boundary	0	6	0	18
'itical environments within 1-mile idius of site	0	10	0	30
iter quality of nearest surface iter body	1	6	6	18
:ound water use of uppermost juifer	3	9	27	27
ipulation served by surface iter supply within 3 miles iwnstream of site	0	6	0	18
ipulation served by ground water ipply within 3 miles of site	3	6	18	18
SUBTOTALS			79	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				44

WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B   60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore   60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/maximum score subtotal)				21

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 50

WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	39
Waste Characteristics	60
Pathways	50
TOTAL	149

divided by 3 = 50 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

50 x 0.95 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

of Site: Landfill No. 11 (LF-11)

tion: Off Utah Ave., South End of Cantonment Area

of Operation or Occurrence: 1940s - Late 1950s

r/Operator: Camp Cooke

ents/Description: Closed in the Late 1950s; Soil Covered

Rated By: J. Kosik, D. McNeill, and J. Bonds

RECEPTORS

ng Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site	1	4	4	12
Distance to nearest well	1	10	10	30
Land use/zoning within 1-mile radius	2	3	6	9
Distance to reservation boundary	0	6	0	18
Critical environments within 1-mile radius of site	0	10	0	30
Water quality of nearest surface water body	1	6	6	18
Ground water use of uppermost aquifer	3	9	27	27
Population served by surface water supply within 3 miles downstream of site	0	6	0	18
Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			71	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				39

WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B   60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore   60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

I. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			16	114
Subscore (100 x factor score subtotal/maximum score subtotal)				14

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 43

. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	45	
Waste Characteristics	60	
Pathways	43	
TOTAL	148	divided by 3 = 49 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

49 x 0.95 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 5 (LF-5)

Location: East Side of 13th St., North of MM Handling Facility

Date of Operation or Occurrence: 1944-1959

Owner/Operator: Camp Cooke, VAFB

Comments/Description: Closed in 1959; Soil Cover

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			81	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				45

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/maximum score subtotal)				21

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	100
Pathways	35
TOTAL	187

divided by 3 = 62 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

62 x 0.95 = 59

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3 (LF-3) and Landfill No. 4 (LF-4)

Location: South VAFB, East of Mesa Rd., North of Bear Creek Rd.

Date of Operation or Occurrence: 1959-1964

Owner/Operator: U.S. Navy

Comments/Description: Closed in 1962; Soil Cover

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			93	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
100 x 1 = 100

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
100 x 1 = 100

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47
Waste Characteristics	100
Pathways	100
TOTAL	247

TOTAL 247 divided by 3 = 82 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

82 x 0.95 = 78

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 2 (LF-2)

Location: South of Intersection of Pine Canyon and Utah Rds.

Date of Operation or Occurrence: 1941-Present

Owner/Operator: Camp Cooke, VAFB

Comments/Description: Open Landfill Constructed in Natural Ravine

Site Rated By: J. Kosik, C. Hendry, J. Bonds, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			85	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
100 x 1.0 = 100

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
100 x 1.0 = 100

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			16	114
Subscore (100 x factor score subtotal/maximum score subtotal)				14

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42
Waste Characteristics	100
Pathways	35
TOTAL	177 divided by 3 = 49 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

59 x 0.95 = 56

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1 (LF-1)

Location: East Side of Utah Ave., North of CES Complex

Date of Operation or Occurrence: 1944-1959

Owner/Operator: Camp Cooke, VAFB

Comments/Description: Closed With Soil Cover

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	0	6	0	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			75	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				42

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
100 x 1 = 100

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
100 x 1 = 100

APPENDIX H

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/maximum score subtotal)				21

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	39	
Waste Characteristics	50	
Pathways	50	
TOTAL	139	divided by 3 = 46 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

46 x 1.0 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Spill Site No. 3 (CS-3)

Location: ABRES "A" Area Neutralization Lagoon

Date of Operation or Occurrence: 1960-1982

Owner/Operator: VAFB

Comments/Description: TCE Discharge to Lake

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	0	10	0	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	0	6	0	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			95	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				53

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) — 1
2. Confidence level (1=confirmed, 2=suspected) — 1
3. Hazard rating (1=low, 2=medium, 3=high) — 3

Factor Subscore A (from 20 to 100 based on factor score matrix) — 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B — 60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore — 60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	53
Waste Characteristics	60
Pathways	100
TOTAL	213 divided by 3 = 71 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

71 x 1 = 71

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Spill Site No. 4 (CS-4)

Location: Titan Tank Farm

Date of Operation or Occurrence: 1963-Present

Owner/Operator: VAFB

Comments/Description: Neutralization Lagoon

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			93	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
80 x 1 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	80
Pathways	100
TOTAL	232

divided by 3 = 77 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

77 x 0.95 = 73

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Spill Site No. 5 (CS-5)

Location: Agena Tank Farm

Date of Operation or Occurrence: 1961-Present

Owner/Operator: VAFB

Comments/Description: Neutralization Lagoon

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			87	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				48

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
80 x 1 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore ___

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48
Waste Characteristics	80
Pathways	100
TOTAL	228 divided by 3 = 76 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

79 x 0.95 = 72

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Spill Site No. 6 (CS-6)

Location: SLC-3 E and SLC-3 W

Date of Operation or Occurrence: 1962-Present

Owner/Operator: VAFB

Comments/Description: Neutralization Lagoon with TCE

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	2	6	12	18
SUBTOTALS			95	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				53

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
80 x 1 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

II. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 100

V. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	53	
Waste Characteristics	80	
Pathways	100	
TOTAL	233	divided by 3 = 78 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

78 x 0.95 = 74

HAZARD ASSESSMENT RATING METHODOLOGY FORM

ne of Site: Chemical Spill Site No. 7 (CS-7)

:ation: SLC-4E and SLC-4W

te of Operation or Occurrence: 1962-Present

ner/Operator: VAFB

ments/Description: Neutralization Lagoons

te Rated By: J. Kosik, D. McNeill, and J. Bonds

RECEPTORS

ting Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site	2	4	8	12
Distance to nearest well	1	10	10	30
Land use/zoning within 1-mile radius	2	3	6	9
Distance to reservation boundary	0	6	0	18
Critical environments within 1-mile radius of site	3	10	30	30
Water quality of nearest surface water body	1	6	6	18
Ground water use of uppermost aquifer	3	9	27	27
Population served by surface water supply within 3 miles downstream of site	0	6	0	18
Population served by ground water supply within 3 miles of site	2	6	12	18
SUBTOTALS			99	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				55

:. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 80 x 1 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

ATHWAYS

If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
. Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 100

STE MANAGEMENT PRACTICES

Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	55
Waste Characteristics	80
Pathways	100
TOTAL	235 divided by 3 = 78 Gross total score

Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

78 x 0.95 = 74

HAZARD ASSESSMENT RATING METHODOLOGY FORM

of Site: Chemical Spill Site No. 8 (CS-8)

ion: South and East of South VAFB Gate

of Operation or Occurrence: 1959-1964

·/Operator: U.S. Navy

nts/Description: Waste Oil and TCE Disposal Site

Rated By: J. Kosik, D. McNeill, and J. Bonds

ECEPTORS

ng Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site	3	4	12	12
Distance to nearest well	2	10	20	30
Land use/zoning within 1-mile radius	2	3	6	9
Distance to reservation boundary	3	6	18	18
Critical environments within 1-mile radius of site	1	10	10	30
Water quality of nearest surface water body	1	6	6	18
Ground water use of uppermost aquifer	3	9	27	27
Population served by surface water supply within 3 miles downstream of site	0	6	0	18
Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			117	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				65

WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

WAYS

f there is evidence of migration of hazardous contaminants, assign aximum factor subscore of 100 points for direct evidence or 80 points or indirect evidence. If direct evidence exists, proceed to C. If o evidence or indirect evidence exists, proceed to B.

Subscore --

ate the migration potential for three potential pathways: surface ater migration, flooding, and ground water migration. Select the ighest rating and proceed to C.

ating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			62	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				57
. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
l. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				21

lighest pathway subscore

:nter the highest subscore value from
ı, B-1, B-2, or B-3 above. Pathways Subscore 57

: MANAGEMENT PRACTICES

ıverage the three subscores for receptors, waste characteristics, and ›athways.

leceptors	65
laste Characteristics	60
'athways	57
'OTAL	182 divided by 3 = 61 Gross total score

ıpply factor for waste containment from waste management practices.
;ross total score x waste management practices factor = final score.

61 x 0.95 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

e: FTA-1

Adjacent to Tangair Rd., SW Quadrant of Runway

ration or Occurrence: 1942-Present

itor: Camp Cooke, VAFB

scription: Unlined Firefighter Training Area

By: J. Kosik, D. McNeill, and J. Bonds

RS

:or	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
:ion within 1,000 feet of site	0	4	0	12
:e to nearest well	0	10	0	30
ie/zoning within 1-mile radius	2	3	6	9
:e to reservation boundary	0	6	0	18
il environments within 1-mile of site	0	10	0	30
quality of nearest surface body	1	6	6	18
water use of uppermost r	3	9	27	27
tion served by surface supply within 3 miles ream of site	0	6	0	18
tion served by ground water within 3 miles of site	3	6	18	18
TALS			57	180
tors subscore (100 x factor subtotal/maximum score subtotal)				32

CHARACTERISTICS

elect the factor score based on the estimated quantity, the degree of azard, and the confidence level of the information.

. Waste quantity (1=small, 2=medium, 3=large)	3
. Confidence level (1=confirmed, 2=suspected)	1
. Hazard rating (1=low, 2=medium, 3=high)	3

actor Subscore A (from 20 to 100 based on factor core matrix) 100

pply persistence factor:
actor Subscore A x Persistence Factor =
ubscore B 100 x 1.0 = 100

pply physical state multiplier:
ubscore B x Physical State Multiplier =
aste Characteristics Subscore 100 x 1.0 = 100

·1. Existing Aboveground POL Storage Facilities
(Continued, Page 3 of 3)

:	Capacity (gal)	Facility No.	Protective Measures
	550	21180	None
	500	21203	None
	275	22100	None
	215	22107	None
	275	22112	None
	275	23100	None
	117	23150	None
	275	23201	None
	3,000	23206	Dike
	117	23209	None
	10,000	23225	Dike
	675	23228	None
	550	23235	None
	550	23241	None
	300	590	None
	300	643	None
	100	654	None
	250	731	None
	250	762	None
	250	835	None
	500	860	None
	250	907	None
	150	1544	None
	500	1801	None
apacity	1,353,927		

-1. Existing Aboveground POL Storage Facilities (Continued, Page 2 of 3)

e	Capacity (gal)	Facility No.	Protective Measures
	4,800	1790	Dike
	835	1795	None
	15,000	1797	Dike
	21,690	1856	Dike
	500	1905	None
	11,000	1962	Dike
	11,000	1963	Dike
	11,000	1964	Dike
	11,000	1965	Dike
	11,000	1966	Dike
	11,000	1967	Dike
	1,812	1971	Dike
	1,812	1972	Dike
	11,000	1974	Dike
	1,075	1978	Dike
	11,000	1986	Dike
	14,500	1987	Dike
	200	1988	None
	11,000	1993	Dike
	275	4101	None
	350	4105	None
rd nt	10	6449	None
	580	6515	None
	500	10525	None
	2,819	10577	Dike
	1,000	10723	None
	1,000	10723	None
	5,000	10745	Dike
	15,000	10745	Dike
	20	11439	None
	55	11477	None
	10,840	13850	Dike
	1,080	21101	None
	16,000	21110	Dike
	1,500	21150	None
	1,000	21155	None
	280	21160	None

-1. Existing Aboveground POL Storage Facilities

e	Capacity (gal)	Facility No.	Protective Measures
l	1,000	178	None
	4,000	185	Dike
	42,000	535	Dike
	30,000	64	Dike
	6,000	185	Dike
	500	188	None
	5,500	393	Dike
	3,275	398	Dike
	1,000	457	None
	1,000	475	None
	6,000	484	Dike
	1,000	490	None
	100	501	None
	1,275	511	None
d	10	875	None
t			
	1,000	872	None
t			
	10,000	879	Dike
	190	1500	None
	350	1555	None
	100	1590	None
	1,000	1610	None
	500	1628	None
	550	1659	None
	125,000	1701	Dike
	420,000	1702	Dike
	210,000	1703	Dike
	40,000	1704	Dike
d	6,000	1727	Dike
t			
	400	1732	None
	250	1748	None
	500	1758	None
	1,200	1756	None
	63,000	1778	Dike
	63,000	1779	Dike
	49,670	1780	Dike
	4,800	1783	Dike
	15,000	1788	Dike

APPENDIX J

POL STORAGE FACILITIES

te	Designation	References (Page Numbers)
l Disposal . 3	CS-3	5, 6, 7, 4-72, 4-73, 4-75, 4-77, 4-78, 4-81, 5-2, 5-4, 6-4, 6-12, 6-20, App. F
l Disposal . 4	CS-4	5, 6, 7, 4-72, 4-73, 4-75, 4-77, 4-78, 4-81, 5-2, 5-3, 6-4, 6-12, 6-20
l Disposal . 5	CS-5	5, 6, 7, 4-72, 4-73, 4-75, 4-77, 4-78, 4-81, 5-2, 5-4 6-4, 6-12, 6-20, App. F
l Disposal . 6	CS-6	5, 6, 7, 4-72, 4-73, 4-76, 4-77, 4-78, 4-81, 5-2, 5-3, 6-3, 6-12, 6-20
l Disposal . 7	CS-7	5, 6, 7, 4-72, 4-74, 4-76, 4-77, 4-78, 4-81, 5-2, 5-3, 6-4, 6-12, 6-20
l Disposal . 8	CS-8	5, 6, 8, 4-72, 4-74, 4-76, 4-77, 4-78, 4-81, 5-2, 5-4, 6-5, 6-13, 6-20
hter Training . 1	FTA-1	5, 6, 8, 4-77, 4-78, 4-79, 4-81, 5-2, 5-5, 6-6, 6-16, 6-17, 6-20, App. F
sposal . 1	DDS-1	5, 6, 9, 4-77, 4-78, 4-81, 5-2, 5-5, 6-6, 6-15, 6-16, 6-20, App. F
l Disposal . 9	CS-9	5, 6, 10, 4-72, 4-74, 4-76, 4-77, 4-78, 4-81, 5-2, 5-6, 6-7, 6-18, 6-20
ed Underground ea	AUTA	5, 6, 10, 4-77, 4-79, 4-81, 5-2, 5-7, 6-8, 6-18, 6-19, 6-20

APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

ite	Designation	References (Page Numbers)
ll No. 1	LF-1	5, 6, 8, 4-57, 4-65, 4-66, 4-67, 4-77, 4-78, 4-81, 5-2, 5-5, 6-5, 6-13, 6-15, 6-20, App. F
ll No. 2	LF-2	4, 5, 6, 3-25, 3-27, 3-28, 4-57, 4-65, 4-66, 4-67, 4-68, 4-77, 4-78, 4-81, 5-1, 5-2, 5-3, 6-3, 6-10, 6-11, 6-20, App. F
ll No. 3	LF-3	5, 6, 8, 4-66, 4-67, 4-68, 4-77, 4-78, 4-81, 5-2, 5-4, 6-5, 6-13, 6-14, 6-20, App. F
ll No. 4	LF-4	5, 6, 8, 4-66, 4-67, 4-68, 4-77, 4-78, 4-81, 5-2, 5-4, 6-5, 6-13, 6-14, 6-20, App. F
ll No. 5	LF-5	5, 6, 9, 4-66, 4-67, 4-68, 4-69, 4-77, 4-78, 4-81, 5-2, 5-6, 6-7, 6-10, 6-18, 6-20
ll No. 11	LF-11	5, 6, 9, 4-66, 4-67, 4-70, 4-71, 4-77, 4-78, 4-81, 5-2, 5-5, 5-6, 6-6, 6-10, 6-16, 6-18, 6-20, App. F
cal Disposal No. 1	CS-1	5, 6, 10, 4-71, 4-72, 4-73, 4-77, 4-78, 4-81, 5-2, 5-6, 5-7, 6-7, 6-10, 6-18, 6-20, App. F
cal Disposal No. 2	CS-2	5, 6, 9, 4-71, 4-72, 4-73, 4-77, 4-78, 4-81, 5-2, 5-6, 6-7, 6-10, 6-18, 6-20

APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			16	114
Subscore (100 x factor score subtotal/maximum score subtotal)				14

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	49
Waste Characteristics	40
Pathways	35
TOTAL	124 divided by 3 = 41 Gross total score

B. Apply factor for waste containment from waste management practices. *Gross total score x waste management practices factor = final score.*

41 x 1 = 41

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Abandoned Underground Tank Area (AUTA)

Location: Camp Cooke Cantonment Area

Date of Operation or Occurrence: 1942 to 1958

Owner/Operator: Camp Cooke

Comments/Description: Abandoned underground fuel oil tanks

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			88	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				49

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
50 x 0.8 = 40

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
40 x 1 = 40

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			30	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				28
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				21

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 28

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	48
Pathways	28
TOTAL	133 divided by 3 = 44 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

44 x 1 = 44

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Disposal Site No. 9 (CS-9)

Location: SLC-2

Date of Operation or Occurrence: 1958 to 1984

Owner/Operator: VAFB

Comments/Description: Delta-Thor Launch Facility

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	0	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			103	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 60 x 0.8 = 48

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 48 x 1.0 = 48

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			16	114
Subscore (100 x factor score subtotal/maximum score subtotal)				14

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42	
Waste Characteristics	80	
Pathways	35	
TOTAL	157	divided by 3 = 52 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

52 x 0.95 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Drum Disposal Site No. 1 (DDS-1)

Location: East of Utah Ave., Adjacent to LF-1

Date of Operation or Occurrence: 1957

Owner/Operator: VAFB

Comments/Description: Oil and Solvent Drum Disposal Site

Site Rated By: J. Kosik, D. McNeill, and J. Bonds

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	0	6	0	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			75	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				42

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 80 x 1 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			30	108
Subscore (100 x factor score subtotal/maximum score subtotal)				28
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			24	114
Subscore (100 x factor score subtotal/maximum score subtotal)				21

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 28

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	32
Waste Characteristics	100
Pathways	28
TOTAL	160 divided by 3 = 53 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

53 x 1.0 = 53

Table J-2. Existing Underground POL Storage Facilities

POL Type	Capacity (gal)	Facility No.	Protective Measures
JP-4	50,000	1710	UG*
JP-4	50,000	1711	UG
RP-1	50,000	1712	UG
AVGAS	50,000	1713	UG
MOGAS	10,000	10000 Complex Area	UG
MOGAS	10,000	10000 Complex Area	UG
MOGAS	5,000	10000 Complex Area	UG
MOGAS	5,000	10000 Complex Area	UG
MOGAS	5,000	10000 Complex Area	UG
MOGAS	5,000	10000 Complex Area	UG
MOGAS	5,000	10000 Complex Area	UG
MOGAS	12,000	10000 Complex Area	UG
MOGAS	12,000	10000 Complex Area	UG
MOGAS	12,000	10000 Complex Area	UG
DF-2	2,000	10000 Complex Area	UG
Waste Oil	1,000	10000 Complex Area	UG
MOGAS	10,000	13600	UG
MOGAS	10,000	13600	UG
Waste Oil	1,000	13600	UG
MOGAS	10,000	S. VAFB GS	UG
MOGAS	10,000	S. VAFB GS	UG
MOGAS	20,000	64	UG
MOGAS	1,000	75	UG
MOGAS	4,000	484	UG
MOGAS	2,000	488	UG
MOGAS	1,500	660	UG
MOGAS	8,000	676	UG
MOGAS	2,000	830	UG
MOGAS	2,000	836	UG
MOGAS	1,000	960	UG
MOGAS	1,000	980	UG
MOGAS	1,000	988	UG
MOGAS	1,000	1050	UG
MOGAS	8,000	1280	UG
MOGAS	12,000	1450	UG
MOGAS	12,000	1565	UG
MOGAS	10,000	1790	UG
MOGAS	12,000	1797	UG
MOGAS	15,000	1856	UG
MOGAS	10,000	1962	UG

Table J-2. Existing Underground POL Storage Facilities (Continued, Page 2 of 4)

POL Type	Capacity (gal)	Facility No.	Protective Measures
MOGAS	10,000	1963	UG
MOGAS	10,000	1964	UG
MOGAS	10,000	1965	UG
MOGAS	10,000	1967	UG
MOGAS	10,000	1970	UG
MOGAS	1,000	1971	UG
MOGAS	1,000	1972	UG
MOGAS	1,000	1976	UG
MOGAS	1,000	1977	UG
MOGAS	1,000	1980	UG
MOGAS	1,000	1981	UG
MOGAS	10,000	1986	UG
MOGAS	12,000	1987	UG
MOGAS	10,000	1993	UG
MOGAS	1,500	10577	UG
MOGAS	1,500	13850	UG
MOGAS	5,000	21150	UG
MOGAS	2,000	23206	UG
MOGAS	8,000	23225	UG
MOGAS	2,000	23235	UG
Heating Oil	500	51	UG
Heating Oil	100	70	UG
Heating Oil	500	175	UG
Heating Oil	250	188	UG
Heating Oil	150	442	UG
Heating Oil	500	475	UG
Heating Oil	500	490	UG
Heating Oil	800	511	UG
Heating Oil	800	513	UG
Heating Oil	300	596	UG
Heating Oil	150	725	UG
Heating Oil	250	761	UG
Heating Oil	350	765	UG
Heating Oil	300	810	UG
Heating Oil	500	839	UG
Heating Oil	500	840	UG
Heating Oil	250	848	UG
Heating Oil	500	852	UG
Heating Oil	500	864	UG

Table J-2. Existing Underground POL Storage Facilities (Continued, Page 3 of 4)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Heating Oil	500	870	UG
Heating Oil	500	871	UG
Heating Oil	500	875	UG
Heating Oil	300	933	UG
Heating Oil	500	1555	UG
Heating Oil	250	1559	UG
Heating Oil	400	1575	UG
Heating Oil	400	1577	UG
Heating Oil	400	1579	UG
Heating Oil	400	1581	UG
Heating Oil	250	1628	UG
Heating Oil	250	1638	UG
Heating Oil	500	1648	UG
Heating Oil	500	1748	UG
Heating Oil	400	1753	UG
Heating Oil	500	1792	UG
Heating Oil	500	1795	UG
Heating Oil	500	1812	UG
Heating Oil	300	1837	UG
Heating Oil	250	1841	UG
Heating Oil	250	1850	UG
Heating Oil	250	1905	UG
Heating Oil	250	1930	UG
Heating Oil	500	1937	UG
Heating Oil	500	1978	UG
Heating Oil	250	1989	UG
Heating Oil	500	6510	UG
Heating Oil	200	9340	UG
Heating Oil	250	10525	UG
Heating Oil	500	21100	UG
Heating Oil	600	21101	UG
Heating Oil	500	21155	UG
Heating Oil	150	21160	UG
Heating Oil	500	21180	UG
Heating Oil	500	21203	UG
Heating Oil	250	22100	UG
Heating Oil	100	22107	UG
Heating Oil	100	22112	UG
Heating Oil	100	23100	UG

Table J-2. Existing Underground POL Storage Facilities
(Continued, Page 4 of 4)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Heating Oil	150	23201	UG
Heating Oil	500	23205	UG
Heating Oil	200	23228	UG
Total Capacity	579,400		

*UG = underground.

Table J-3. Abandoned Underground POL Storage Facilities

POL Type	Capacity (gal)	Facility No.	Protective Measures
JP-4	10,000	1702	UG
JP-4	5,000	1703	UG
DF-2	12,000	3300	UG
DF-2	12,000	3300	UG
DF-2	12,000	3300	UG
DF-2	12,000	3300	UG
DF-2	12,000	4400	UG
DF-2	12,000	4400	UG
DF-2	12,000	4400	UG
DF-2	12,000	4400	UG
Waste Oils	22,000	6830	UG
Waste Solvent/DF-2	12,000	6400	UG
Fuel Oil	576	2001	UG
Fuel Oil	1,128	2002	UG
Fuel Oil	264	2003	UG
Fuel Oil	576	2004	UG
Fuel Oil	1,128	2005	UG
Fuel Oil	264	2006	UG
Fuel Oil	576	2007	UG
Fuel Oil	2,200	2230	UG
Fuel Oil	2,200	2330	UG
Fuel Oil	1,128	2201	UG
Fuel Oil	2,200	2202	UG
Fuel Oil	576	2204	UG
Fuel Oil	576	2205	UG
Fuel Oil	1,128	2216	UG
Fuel Oil	2,200	2206	UG
Fuel Oil	1,128	2208	UG
Fuel Oil	1,128	2217	UG
Fuel Oil	1,128	2301	UG
Fuel Oil	2,200	2302	UG
Fuel Oil	2,200	2219	UG
Fuel Oil	1,128	2213	UG
Fuel Oil	576	2220	UG
Fuel Oil	576	2304	UG
Fuel Oil	576	2221	UG
Fuel Oil	576	2305	UG
Fuel Oil	264	2315	UG
Fuel Oil	264	2316	UG

Table J-3. Abandoned Underground POL Storage Facilities (Continued, Page 2 of 13)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Fuel Oil	2,200	2306	UG
Fuel Oil	2,200	2223	UG
Fuel Oil	1,128	2224	UG
Fuel Oil	1,128	2308	UG
Fuel Oil	1,128	2324	UG
Fuel Oil	1,128	2323	UG
Fuel Oil	576	2212	UG
Fuel Oil	1,128	2317	UG
Fuel Oil	2,200	2319	UG
Fuel Oil	576	2320	UG
Fuel Oil	576	2321	UG
Fuel Oil	1,128	2322	UG
Fuel Oil	576	3001	UG
Fuel Oil	576	3101	UG
Fuel Oil	2,200	3102	UG
Fuel Oil	2,200	3106	UG
Fuel Oil	576	3108	UG
Fuel Oil	1,128	3115	UG
Fuel Oil	1,128	3002	UG
Fuel Oil	1,128	3114	UG
Fuel Oil	264	3130	UG
Fuel Oil	264	3003	UG
Fuel Oil	576	3004	UG
Fuel Oil	264	3006	UG
Fuel Oil	1,128	3005	UG
Fuel Oil	576	3007	UG
Fuel Oil	1,128	3214	UG
Fuel Oil	576	3118	UG
Fuel Oil	1,128	3120	UG
Fuel Oil	576	3121	UG
Fuel Oil	2,200	3124	UG
Fuel Oil	576	3125	UG
Fuel Oil	576	3201	UG
Fuel Oil	2,200	3202	UG
Fuel Oil	2,200	3204	UG
Fuel Oil	2,200	3206	UG
Fuel Oil	576	3208	UG
Fuel Oil	576	3129	UG
Fuel Oil	576	3218	UG
Fuel Oil	2,200	3220	UG

ble J-3. Abandoned Underground POL Storage Facilities
(Continued, Page 3 of 13)

L Type	Capacity (gal)	Facility No.	Protective Measures
el Oil	576	3221	UG
el Oil	1,128	3222	UG
el Oil	2,200	3224	UG
el Oil	576	3225	UG
el Oil	1,128	3215	UG
el Oil	264	3130	UG
el Oil	264	3230	UG
el Oil	264	4025	UG
el Oil	1,128	4005	UG
el Oil	1,128	4006	UG
el Oil	1,128	4001	UG
el Oil	1,128	4007	UG
el Oil	576	4014	UG
el Oil	1,128	4008	UG
el Oil	1,128	4002	UG
el Oil	576	4015	UG
el Oil	1,128	4010	UG
el Oil	1,128	4003	UG
el Oil	1,128	4011	UG
el Oil	576	4016	UG
el Oil	576	4018	UG
el Oil	264	4114	UG
el Oil	264	4024	UG
el Oil	576	4019	UG
el Oil	576	4020	UG
el Oil	1,128	4021	UG
el Oil	264	4022	UG
el Oil	576	4101	UG
el Oil	2,200	4102	UG
el Oil	576	4107	UG
el Oil	2,200	4108	UG
el Oil	1,128	4110	UG
el Oil	1,128	4203	UG
el Oil	2,200	4204	UG
el Oil	576	4206	UG
el Oil	1,128	4126	UG
el Oil	576	4127	UG
el Oil	576	4128	UG
el Oil	2,200	4130	UG
el Oil	2,200	4132	UG
el Oil	576	4133	UG

able J-3. Abandoned Underground POL Storage Facilities (Continued, Page 4 of 13)

OL Type	Capacity (gal)	Facility No.	Protective Measures
uel Oil	576	4207	UG
uel Oil	2,200	4208	UG
uel Oil	1,128	4210	UG
uel Oil	1,128	4211	UG
uel Oil	576	4214	UG
uel Oil	264	4121	UG
uel Oil	264	4219	UG
uel Oil	576	4232	UG
uel Oil	2,200	4225	UG
uel Oil	2,200	4226	UG
uel Oil	264	4227	UG
uel Oil	2,200	4229	UG
uel Oil	1,128	4230	UG
uel Oil	204	4117	UG
uel Oil	1,128	4119	UG
uel Oil	1,128	4215	UG
uel Oil	1,128	4218	UG
uel Oil	1,128	4004	UG
uel Oil	1,128	4012	UG
uel Oil	1,128	4013	UG
uel Oil	1,128	4030	UG
uel Oil	576	4010	UG
uel Oil	576	4301	UG
uel Oil	2,202	4302	UG
uel Oil	2,200	4304	UG
uel Oil	576	4306	UG
uel Oil	576	4307	UG
uel Oil	2,200	4308	UG
uel Oil	2,200	4310	UG
uel Oil	576	4312	UG
uel Oil	264	4319	UG
uel Oil	264	5120	UG
uel Oil	2,200	4325	UG
uel Oil	576	4326	UG
uel Oil	576	4327	UG
uel Oil	1,128	4329	UG
uel Oil	576	5107	UG
uel Oil	576	5108	UG
uel Oil	2,200	5121	UG
uel Oil	2,200	5123	UG

le J-3. Abandoned Underground POL Storage Facilities
(Continued, Page 5 of 13)

Type	Capacity (gal)	Facility No.	Protective Measures
l Oil	2,200	5125	UG
l Oil	576	5126	UG
l Oil	576	5127	UG
l Oil	2,200	5129	UG
l Oil	[illegible],200	5131	UG
l Oil	576	5132	UG
l Oil	264	4313	UG
l Oil	264	5114	UG
l Oil	1,128	5004	UG
l Oil	1,128	4315	UG
l Oil	1,128	4318	UG
l Oil	264	5116	UG
l Oil	1,128	5118	UG
l Oil	1,128	5003	UG
l Oil	576	5005	UG
l Oil	264	5214	UG
l Oil	576	5006	UG
l Oil	264	5008	UG
l Oil	264	5009	UG
l Oil	264	5314	UG
l Oil	264	5313	UG
l Oil	576	5201	UG
l Oil	1,128	5202	UG
l Oil	1,128	5203	UG
l Oil	2,200	5204	UG
l Oil	576	5206	UG
l Oil	576	5127	UG
l Oil	576	5207	UG
l Oil	2,200	5208	UG
l Oil	1,128	5210	UG
l Oil	2,200	5219	UG
l Oil	2,200	5131	UG
l Oil	1,128	5132	UG
l Oil	576	5301	UG
l Oil	2,200	5302	UG
l Oil	2,200	5304	UG
l Oil	576	5306	UG
l Oil	576	5307	UG
l Oil	2,200	5308	UG
l Oil	2,200	5310	UG

e J-3. Abandoned Underground POL Storage Facilities (Continued, Page 6 of 13)

Type	Capacity (gal)	Facility No.	Protective Measures
Oil	576	5312	UG
Oil	2,200	5225	UG
Oil	576	5226	UG
Oil	2,200	5227	UG
Oil	2,200	5221	UG
Oil	1,128	5230	UG
Oil	576	5232	UG
Oil	576	5322	UG
Oil	2,200	5325	UG
Oil	576	5326	UG
Oil	576	5327	UG
Oil	2,200	5329	UG
Oil	1,128	5330	UG
Oil	1,128	5331	UG
Oil	2,200	6101	UG
Oil	1,128	5215	UG
Oil	1,128	5218	UG
Oil	1,128	5315	UG
Oil	1,128	5318	UG
Oil	264	5319	UG
Oil	1,128	5003	UG
Oil	576	6015	UG
Oil	2,200	6001	UG
Oil	1,128	5318	UG
Oil	264	5314	UG
Oil	1,128	6007	UG
Oil	576	6008	UG
Oil	264	6213	UG
Oil	1,128	6102	UG
Oil	1,128	6105	UG
Oil	2,200	6103	UG
Oil	1,128	6104	UG
Oil	264	5314	UG
Oil	1,128	5501	UG
Oil	2,200	5503	UG
Oil	576	5507	UG
Oil	576	6008	UG
Oil	264	6014	UG
Oil	264	6009	UG
Oil	1,128	6010	UG
Oil	576	6011	UG

J-3. Abandoned Underground POL Storage Facilities
(Continued, Page 7 of 13)

pe	Capacity (gal)	Facility No.	Protective Measures
il	576	6012	UG
il	264	6314	UG
il	264	6214	UG
il	576	6201	UG
il	2,200	6202	UG
il	2,200	6204	UG
il	576	6206	UG
il	2,200	6207	UG
il	576	6221	UG
il	1,128	6222	UG
il	1,128	6223	UG
il	2,200	6225	UG
il	576	6226	UG
il	576	6227	UG
il	2,200	6229	UG
il	1,128	6230	UG
il	576	6301	UG
il	2,200	6302	UG
il	2,200	6304	UG
il	576	6306	UG
il	576	6307	UG
il	2,200	6309	UG
il	1,128	6310	UG
il	2,200	6312	UG
il	1,128	6324	UG
il	2,200	6320	UG
il	1,128	6321	UG
il	264	6333	UG
il	1,128	6215	UG
il	264	6218	UG
il	264	6316	UG
il	264	6318	UG
il	264	6314	UG
il	576	6012	UG
il	2,200	6013	UG
il	264	7001	UG
il	1,128	7114	UG
il	264	7120	UG
il	576	7101	UG
il	2,200	7102	UG

·3. Abandoned Underground POL Storage Facilities
(Continued, Page 8 of 13)

Capacity (gal)	Facility No.	Protective Measures
1,128	7104	UG
576	7107	UG
2,200	7108	UG
2,200	7110	UG
264	6316	UG
264	6318	UG
1,128	7118	UG
1,128	8001	UG
1,128	8006	UG
1,128	8005	UG
1,128	8004	UG
576	8012	UG
576	7221	UG
2,200	7223	UG
2,200	7225	UG
576	7226	UG
2,200	7227	UG
2,200	7229	UG
2,200	7231	UG
576	7232	UG
264	7008	UG
264	7002	UG
1,128	7003	UG
576	7004	UG
264	7006	UG
264	7009	UG
264	7214	UG
576	7007	UG
1,128	8015	UG
576	7121	UG
2,200	7123	UG
1,128	7124	UG
2,200	7204	UG
576	7206	UG
576	7207	UG
2,200	7208	UG
576	7127	UG
2,200	7129	UG
2,200	7131	UG
576	7132	UG
264	7220	UG

3. Abandoned Underground POL Storage Facilities
(Continued, Page 9 of 13)

Capacity (gal)	Facility No.	Protective Measures
1,128	7215	UG
1,128	7218	UG
1,128	8011	UG
1,128	8010	UG
1,128	8009	UG
576	8014	UG
1,128	8003	UG
1,128	8008	UG
1,128	8007	UG
1,128	8002	UG
576	8013	UG
1,128	8101	UG
2,200	8102	UG
576	8104	UG
576	8105	UG
2,200	8106	UG
2,200	8108	UG
1,128	8110	UG
576	8112	UG
1,128	8120	UG
2,200	8122	UG
576	8123	UG
576	8124	UG
2,200	8126	UG
1,128	8127	UG
1,128	8128	UG
2,200	8130	UG
576	8131	UG
576	8201	UG
2,200	8202	UG
576	8204	UG
576	8205	UG
2,200	8206	UG
2,200	8208	UG
2,200	8210	UG
576	8212	UG
1,128	8220	UG
2,200	8222	UG
576	8223	UG
576	8224	UG
2,200	8226	UG

Abandoned Underground POL Storage Facilities
(Continued, Page 10 of 13)

Capacity (gal)	Facility No.	Protective Measures
1,128	8227	UG
2,200	8230	UG
576	8231	UG
264	8021	UG
1,128	8017	UG
264	8018	UG
576	8019	UG
1,128	8118	UG
264	8119	UG
1,128	8218	UG
2,200	8142	UG
1,128	8114	UG
1,128	8117	UG
1,128	8214	UG
1,128	8217	UG
264	8232	UG
1,128	8020	UG
264	9001	UG
264	9118	UG
576	9002	UG
1,128	9003	UG
264	9004	UG
264	9006	UG
576	9005	UG
1,128	9101	UG
2,200	9102	UG
576	9104	UG
576	9105	UG
2,200	9108	UG
2,200	9112	UG
576	9120	UG
2,200	9122	UG
576	9123	UG
576	9124	UG
2,200	9125	UG
1,128	9201	UG
2,200	9202	UG
576	9204	UG
576	9205	UG
2,200	9206	UG
1,128	9208	UG

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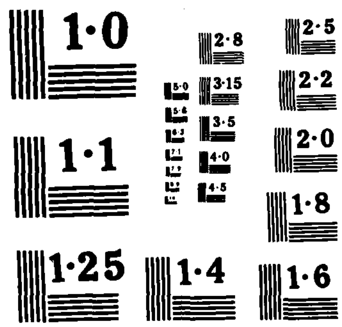

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Table J-3. Abandoned Underground POL Storage Facilities
(Continued, Page 11 of 13)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Fuel Oil	1,128	9211	UG
Fuel Oil	576	9212	UG
Fuel Oil	264	9213	UG
Fuel Oil	1,128	9114	UG
Fuel Oil	264	9116	UG
Fuel Oil	1,128	9117	UG
Fuel Oil	1,128	9214	UG
Fuel Oil	1,128	9217	UG
Fuel Oil	5,000	9008	UG
Fuel Oil	2,200	9222	UG
Fuel Oil	576	9223	UG
Fuel Oil	576	9224	UG
Fuel Oil	2,200	9226	UG
Fuel Oil	1,128	9227	UG
Fuel Oil	576	10116	UG
Fuel Oil	264	10113	UG
Fuel Oil	2,200	10103	UG
Fuel Oil	2,200	10101	UG
Fuel Oil	1,128	10214	UG
Fuel Oil	264	10318	UG
Fuel Oil	576	10316	UG
Fuel Oil	264	10315	UG
Fuel Oil	576	10202	UG
Fuel Oil	264	10201	UG
Fuel Oil	1,128	10306	UG
Fuel Oil	2,200	10303	UG
Fuel Oil	1,128	10301	UG
Fuel Oil	264	10003	UG
Fuel Oil	1,128	10005	UG
Fuel Oil	264	10313	UG
Fuel Oil	576	10414	UG
Fuel Oil	264	10413	UG
Fuel Oil	1,128	10515	UG
Fuel Oil	2,200	10514	UG
Fuel Oil	2,200	10401	UG
Fuel Oil	576	10503	UG
Fuel Oil	264	10501	UG
Fuel Oil	2,200	11108	UG
Fuel Oil	2,200	11112	UG
Fuel Oil	2,200	11110	UG
Fuel Oil	2,200	11119	UG
Fuel Oil	2,200	11125	UG

Table J-3. Abandoned Underground POL Storage Facilities (Continued, Page 12 of 13)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Fuel Oil	2,200	11124	UG
Fuel Oil	5,170 (12 tanks)	Pump Station	UG
Fuel Oil	576	13401	UG
Fuel Oil	1,128	13404	UG
Fuel Oil	576	13409	UG
Fuel Oil	264	13412	UG
Fuel Oil	2,200	13414	UG
Fuel Oil	2,200	13416	UG
Fuel Oil	2,200	13418	UG
Fuel Oil	2,200	13420	UG
Fuel Oil	1,128	13421	UG
Fuel Oil	2,200	13424	UG
Fuel Oil	2,200	13501	UG
Fuel Oil	2,200	13503	UG
Fuel Oil	2,200	13505	UG
Fuel Oil	2,200	13507	UG
Fuel Oil	2,200	13509	UG
Fuel Oil	2,200	13511	UG
Fuel Oil	2,200	13513	UG
Fuel Oil	1,128	13516	UG
Fuel Oil	576	13520	UG
Fuel Oil	264	13532	UG
Fuel Oil	264	13024	UG
Fuel Oil	1,128	13025	UG
Fuel Oil	576	13026	UG
Fuel Oil	264	13027	UG
Fuel Oil	264	13028	UG
Fuel Oil	1,128	13005	UG
Fuel Oil	1,128	13004	UG
Fuel Oil	1,128	13002	UG
Fuel Oil	264	13001	UG
Fuel Oil	264	13101	UG
Fuel Oil	576	13103	UG
Fuel Oil	264	13106	UG
Fuel Oil	264	13117	UG
Fuel Oil	1,128	13113	UG
Fuel Oil	2,200	13116	UG
Fuel Oil	1,128	13118	UG
Fuel Oil	1,128	13201	UG
Fuel Oil	2,200	13203	UG
Fuel Oil	1,128	13200	UG
Fuel Oil	2,200	13207	UG
Fuel Oil	2,200	13209	UG

Table J-3. Abandoned Underground POL Storage Facilities
(Continued, Page 13 of 13)

POL Type	Capacity (gal)	Facility No.	Protective Measures
Fuel Oil	2,200	13211	UG
Fuel Oil	264	13213	UG
Fuel Oil	576	13216	UG
Fuel Oil	1,128	13217	UG
Fuel Oil	576	13222	UG
Fuel Oil	264	13224	UG
Fuel Oil	264	13019	UG
Fuel Oil	576	13020	UG
Fuel Oil	2,200	13021	UG
Fuel Oil	1,128	13022	UG
Fuel Oil	264	13016	UG
Fuel Oil	1,128	13014	UG
Fuel Oil	1,128	13011	UG
Fuel Oil	1,128	13010	UG
Fuel Oil	3 (20,000)	12005	UG
Fuel Oil	1,128	11007	UG
Fuel Oil	1,128	11006	UG
Fuel Oil	576	11004	UG
Fuel Oil	264	11003	UG
Fuel Oil	264	11002	UG
Fuel Oil	1,128	11001	UG
Fuel Oil	1,128	10515	UG
Fuel Oil	2,200	10514	UG
Fuel Oil	576	11009	UG

APPENDIX K

MONITOR WELL CONSTRUCTION DETAILS AND AVAILABLE LITHOLOGIC LOGS

Table K-1. Monitor Well Construction Details

Details	W-4	W-5	W-6	W-7	W-8	W-9	W-10	W-11	W-12	W-13	W-14	W-22	W-23
Altitude of Land Surface (ft)	310	310	145	425	20	22	30	390	260	140	35	139	138
Depth of Hole (ft)	340	1,045	120	420	82	110	80	33	41	98	103	22	70
Blank Casing Intervals (ft)	0-98 298-338	0-410 520-600 700-780 840-920 1,000-1,020	0-60	0-100 220-240	0-20 60-80	0-20 60-80	0-20 60-80	0-11	0-7.5	--	0-24	0-10	0-10
Perforated Intervals (ft)	98-298	410-520 600-700 780-840 920-1,000	60-100	100-220	20-60	20-60	20-60	11-31	7.5-27.5	0-39.5	24-44	10-22	10-70
Casing Diameter (inches)	6	6	6	6	6	6	6	4	4	4	4	6	6
Depth to Water (ft)	11.01	10.17	9.51	56.5	13.8	11.74	18.98	8.15	3.82	Dry	22.52	20.38	64.77
Casing Material	NA*	NA	NA	Steel	PVC	PVC	Steel	PVC	PVC	PVC	PVC	PVC	PVC
Development Method	NA	NA	NA	Airlift	Airlift	Airlift	Airlift	Airlift	Airlift	Airlift	Airlift	Airlift	Airlift
Total Well Depth (ft)	338	1,020	100	240	80	80	80	31	27.5	39.5	44	22	70

*NA = Not available.

Note: These wells must be inspected before use as monitor wells.

Source: BES, 1984.

8N/35W/35Q1 (WETSU 11)

Depth of well 33.5 feet

Diameter 4"

USGS Well Location #__________________________

Perforated 11.5-31.5 feet. Alt. 390 feet.

	Thickness (ft)	Depth (ft)
Garbage - newspaper, neck lace, metal, elastics	5	0-5
Sand - beach dry wind blown, light olive gray	10	5-15
Sand - course but more clear sand, light olive gray	5	15-20
Sand - beach, not much course, light olive gray	3	20-23
Sand - beach, shale bits	2	23-25
Sand - beach, shale bits - getting lighter	5	25-30
Shale, sand (trace), light olive brown	3	30-33
Shale, sand (trace), light olive brown	-	33.5

[illegible]--Lithologic log of test hole [illegible]

	Thickness (feet)	Depth (feet)
Sand, medium, subrounded, with shale, dusky-yellowish brown--	[illegible]	10
Sand, fine to medium, subrounded, with weathered shale, whitish-gray, shale content tends to increase with depth, dark-yellowish-brown--------------------	[illegible]	[illegible]
Shale, moderate-yellow-brown--------------------------	11	41

7N/35W-11R1 (WETSU 13)

Depth of well 98 feet

Diameter 4"

USGS Well Location # N344203 / W1203136

Alt. 130 feet

	Thickness (ft)	Depth (ft)
Top soil, black-dark yellowish brown	8	0-8
Soil, sand, some shale - dark yellowish brown	7	8-15
Sand, medium, soil, bits of shale dark yellowish brown	8	15-23
Sand, medium (small pebbles) bits of shale	7	23-30
Sand, medium, small rocks, some shale, dark yellowish brown	10	30-40
Sand, medium, some shale, dark yellow-brown	10	40-50
Sand, medium, few small pebbles, few shale, dark yellowish brown	10	50-60
Shale, fine sand, light yellow-brown	10	60-70
Shale, few fine sand, moderate yellow brown	10	70-80
Shale, grayish white	6	80-86
Shale, dusky-yellow	6	86-92
Shale, dusky, yellow	6	92-98

7N/35W-13N2 (WETSU #14)

Depth of well 103 feet

Diameter 4'

USGS Well Location #____________________________

Perforated 22-44 feet. Alt. 35 feet

	Thickness (ft)	Depth (ft)
Sand, fine-medium (top soil) few shale	20	0-20
Sand, fine-medium (top soil) few shale	23	20-43
Sand, fine-medium (top soil) few shale	12	43-55
Sand, medium, clay, some shale bits	8	55-63
Sand, medium, fine, shale bits, clay	10	63-73
Shale - angular pieces, clay (trace)	10	73-83
Shale, clay (trace)	10	83-93
Whitish clay, shale - large small angular pieces	10	93-103

TABLE 6.--Lithologic log of test hole Wetsu 22

	Thickness (feet)	Depth (feet)
Sand, fine, light-brown	8	8
Sand, medium, light-brown	4	12
Sand, medium to coarse, with few cobbles, brown	3	15
Sand, medium to coarse	5	20
Shale, white	2	22

TABLE 7.--Lithologic log of test hole Wetsu 23

	Thickness (feet)	Depth (feet)
Sand, coarse, with gravel, yellowish-brown-------	10	10
Sand, medium to coarse, light-brown--------------	10	20
Sand, medium, well sorted, with clay, yellowish-brown--	5	25
Clay with shale fragments, light-brown-----------	5	30
Sand, fine to medium, well sorted, light-brown---	20	50
Shale, weathered, light-brown--------------------	15	65
Shale, light-brown-------------------------------	5	70

7N35W9R1 (WETSU 25) July 1984

Depth of well 200 feet

Diameter 12"

USGS Well Location #____________________________

Alt.

	Thickness (ft)	Depth (ft)
Rock Cuttings and Clay	20	10-20
Rock and Sand	10	25-30
Sand and Rock Clay	5	35
Sand and Rock	25	40-60
Sand Only	5	65
Clay and sand	5	70
Clay, Rock and Sand	5	75
Sand and Rock	5	80
Sand	5	85
Sand and Rock	10	90-95
Sand	5	100
Sand	10	105-110
Sand and Clay	5	115
Sand	5	120
Sand and small amount clay	5	125
Sand	60	130-185
Sand and Clay	5	190
Sand and hard rock	5	195
Hard Rock	2	198-199

7N/35W16 H1 (WETSU 26) July 1984

Depth of well 200 feet

Diameter 12¼"

USGS Well Location #____________________________

Alt.

	Thickness (ft)	Depth (ft)
Sand	35	5 - 35
Cutting Sampled - Sand/Rock Gravel	5	42
Clay, Gravel	10	45
Rock	5	55
Formation Test Hard Rock, Clay	5	60
Density Test 9 lbs, Sand Test 2.4%		60
Sand, Gravel	15	65-75
Clay, Sand and Gravel	15	80-90
Sand, Gravel, Rock, Clay	5	95
Gravel, Sand, Clay	5	100
Rock, Sand, Gravel, Clay	5	105
Sand, Rock Cuttings	45	110-150
Sand	5	155
Sand, Rock	5	160
Sand and Rock Cuttings	5	165
Sand and Rock Cuttings	25	170-190
Rock	5	195
Sand, Rock and Clay	5	200

6N35W5 F2 (WETSU 27) July 1984

Depth of well 200 feet

Diameter 12.25"

USGS Well Location #________________

Alt.

	Thickness (ft)	Depth (ft)
Black Clay	5	5
Clay, Rock	5	10
Sand, Rock	5	15
Sand, Gravel/Clay	5	20
Clay, Gravel/Sand	15	25-40
Clay, Sand	5	45
Clay	5	50
Clay, Sand	5	55
Sand and Clay	5	60
Sand and Clay	20	65-80
Clay, Sand and Rock Cuttings	35	85-105
Sand, Rock	5	110
Sand, Rock, Clay	5	115
Clay, Sand	5	120
Clay, Rock, Chips	10	125-130
Clay, Sand	5	135
Clay, Rock	5	140
Clay, Rock	5	145
Clay, Sand	5	150
Clay, Sand	5	155
Clay	5	160
Clay, Sand	15	165-175
Clay, Sand	15	180-190
Clay and Sand, Rock	10	195-200

6N/35W - 5 K 1 (WETSU 28)

July 1984

Depth of well 200 feet

Diameter 12.25"

USGS Well Location #________________

Alt.

	Thickness (ft)	Depth (ft)
Sand, Rock, Clay	15	10-15
Sand, Rock	10	20-25
Sand, Rock, Clay	5	30
Sand, Rock	10	35-40
Clay, Sand, Rock	5	45
Rock and Sand	5	50
Gravel, Sand and Clay	10	55-60
Gravel, Clay and Sand	5	65
Clay and Sand	15	70-80
Clay and Sand	10	85-90
Clay	50	100-140
Clay	25	150-165
Clay and Sand	5	170
Clay	30	175-200

8N/35W35_ _ _ _ (WETSU 29)

July 1984

Depth of well 95 feet

Diameter 12¼"

USGS Well Location #____________

Alt.

	Thickness (ft)	Depth (ft)
Sand	5	5
Clay and sand	10	10-15
Sand	5	20
Clay and Sand	5	25
Rock Chips and Clay	5	30
Sand	10	35-40
Sand, Clay,Rock	25	45-65
Sand, Clay, Rock	5	70
Sand, Clay	10	75-80
Sand, Rock	5	85
Sand, Rock, Clay	5	90
Sand, Rock	5	95

5N/35W35L1

END

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8-85

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